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GAS

A SPECIAL REPORT

THE STORY OF PEOPLES GAS

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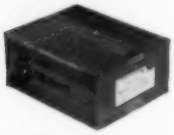
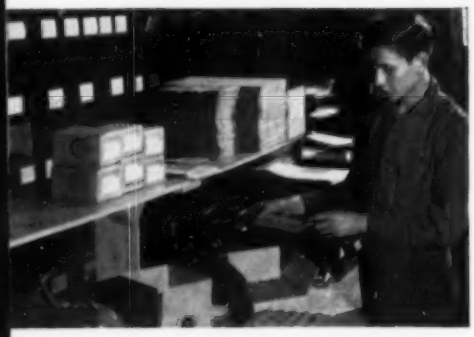


Parts Packaging Program

Before packaging, diaphragms are sealed in moisture-retaining envelopes.



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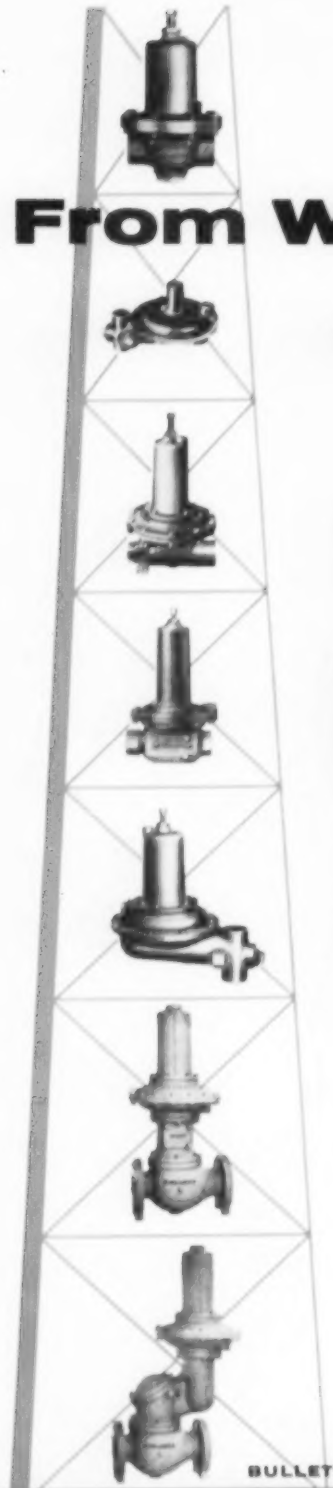

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GAS

32nd YEAR OF PUBLICATION

IN THIS ISSUE . . . .

The Peoples Gas Light & Coke Co., Chicago, is a completely integrated gas company. It produces, transmits, and distributes natural gas. For the story of its distribution, see page 53; for the transmission picture, see page 151. Also, Transco has installed a reciprocating gas engine to drive a mainline centrifugal compressor. A complete report on this station will be found on page 164.

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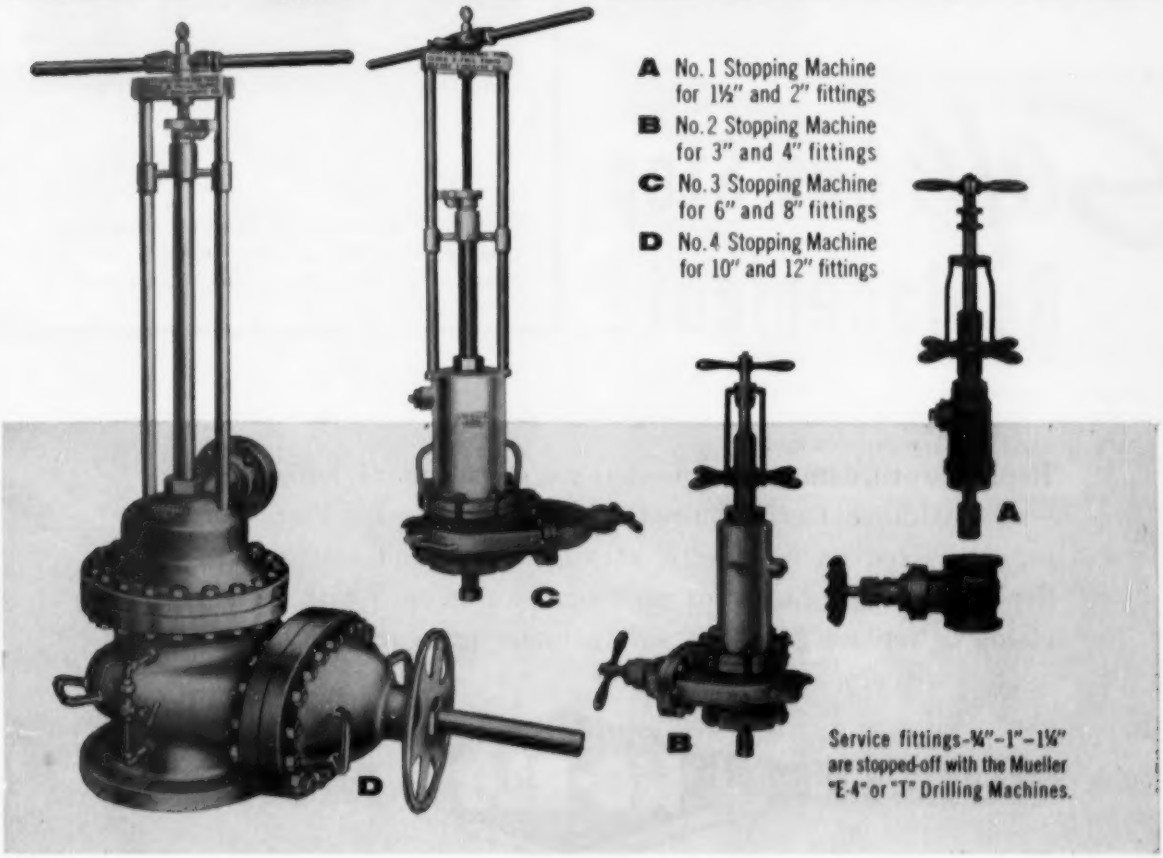
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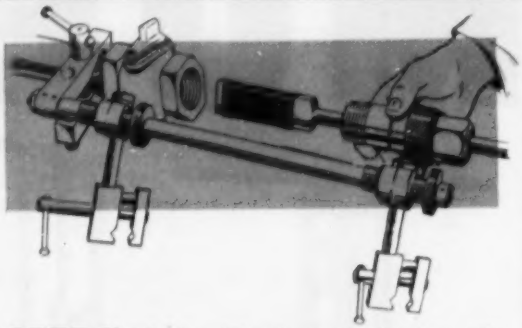

STEP 1: Attach safety clamp and plugging unit.
Close stop. Remove house piping from stop outlet. Attach safety clamp to inlet pipe. Retract plug and screw plugging unit into stop.

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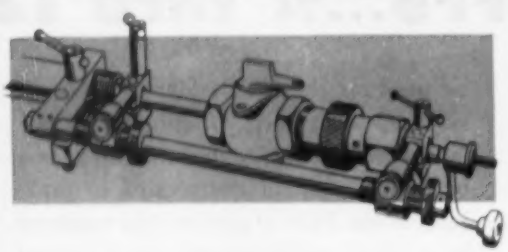
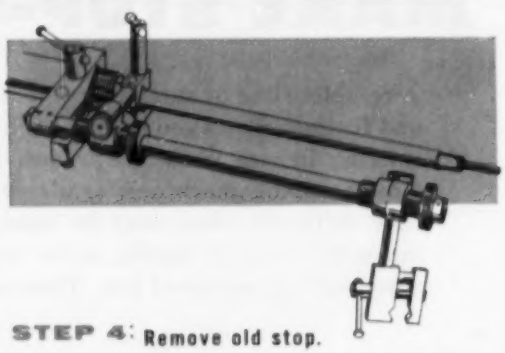


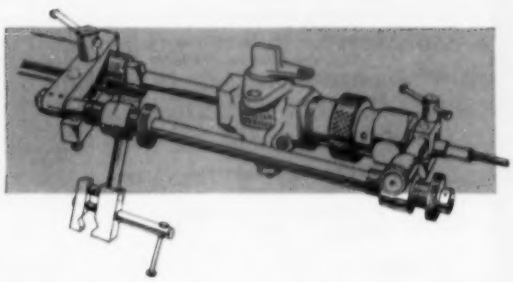
STEP 3: Unscrew old stop.
Unscrew old stop – slide to rear. Position front clamp by adjusting threaded sleeve. Tighten front clamp on shaft.



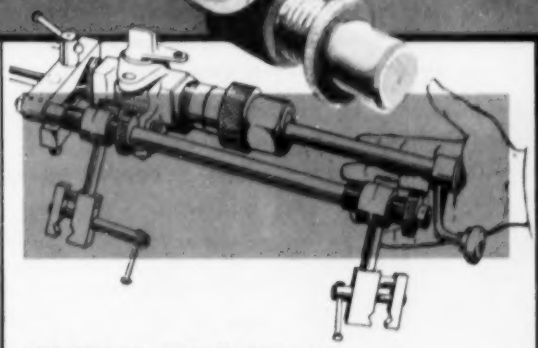
STEP 4: Remove old stop.
Release rear clamp from shaft. Slide stop and pressure chamber from shaft. Front clamp holds stopper in position.

Write for the No-Blo® Method Booklet "Safe Operating Practice." It shows how other gas installations are made in a safe manner, without escape of gas.

STEP 2: Insert and expand stopper.
Open stop and insert stopper. Tighten rear clamp on shaft and expand stopper. Slide "O" ring collar forward, exposing test hole, to test for tight stop off.



STEP 5: Slide new stop onto shaft.
Open new stop – screw pressure chamber into stop and slide on to shaft. Tighten rear clamp. Release front clamp.



STEP 6: Install new stop.
Screw new stop onto pipe. Release stopper and withdraw through stop. Close stop, test for leaks and remove No-Blo Stop Changer. Connect house piping and open new stop to complete installation.

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GAS Thermally Thinking

A personal message from Jay Jenkins

AFTER exactly 31 years as a Jenkins publication, GAS will become a Chilton publication, effective with the June issue. The present staff will be retained and expanded and I shall remain with the magazine in a consulting and advisory capacity.

In making this announcement to our readers and advertisers, I am happy to be able to tell you that GAS enjoyed the greatest year in its history in 1955 and that the sale of the magazine was prompted only by the fact that men do reach the age where they wish to ease up, whereas the industries they serve continue to be infused with new blood and to march on.

It has been very difficult for me to reconcile myself to relinquishing control of the magazine. I have grown up in the gas industry and I have made many fine and lasting friendships in it, which I cherish deeply. We have seen natural gas develop from a fledgling into one of America's major industries, ranked by many as the sixth largest. I am very proud to have had a part in this growth and I feel a deep sense of gratitude to the many thousands of men in the gas industry and in the companies supplying the industry who have loyally supported the magazine. Without their support, its success would not have been possible.

I feel that the change of ownership at this time is in the best interests of everyone. The Chilton Company is one of the oldest, largest, and most highly respected publishing companies in America. They now own and publish 15 business magazines, including such stalwarts as *Iron Age* and *Hardware Age* — both more than a hundred years old and known to everyone in American business. Their production facilities are second to none and they have the organization and finances to keep GAS completely in step with the constantly expanding needs of the gas industry. I feel, therefore, that I am entrusting you to very good hands.

In conclusion, I should like to say that my interest in the GAS audience and the gas industry will never diminish. I shall be close by, in my consulting capacity, working behind the scenes to help GAS to serve you constantly better and better.

My very best to all of you!

President & Founder

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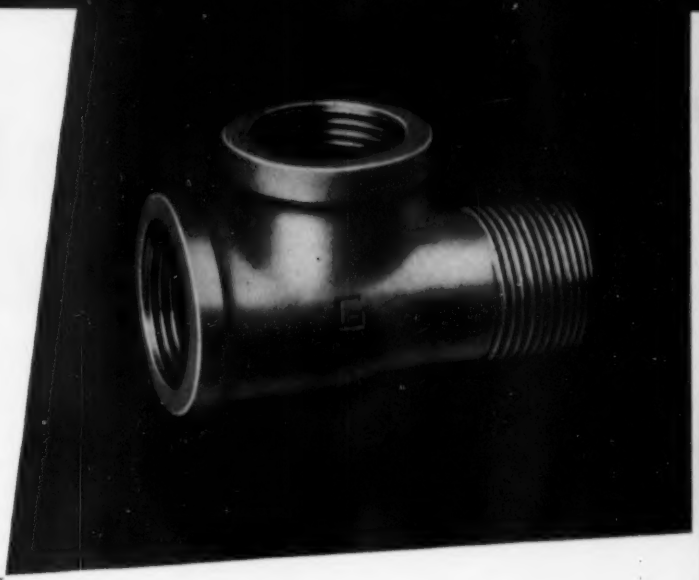

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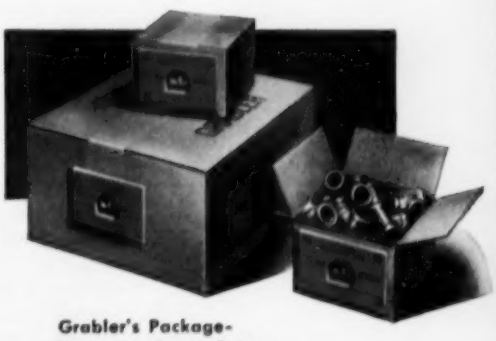

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highlights

GAS — SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

From an editor's notebook

While in the "City" for NACE chores saw deep, deep snow in late March and noted Consolidated Edison's bleed-off vent flares burning in midtown Manhattan as the conversion program to straight natural gas makes progress in our largest metropolitan district. They expect to have this gigantic conversion operation completed by fall and are using their own crews for the work. Experts had warned ConEd that conversion in the jumble and jungle of Harlem would be impossibly complex; however, the area was converted without any major trouble. Many antiquated, questionable appliances (particularly ancient, two-burner, gas-fired hotplates) were located and replaced with new, safe equipment at no cost to the users.

* * *

Rocky Mountain Corp. and Technical Industries Corp. are in the early stages of planning for a natural gas pipeline to extend from Pinedale, Wyo., through the Twin Cities and Milwaukee into the Chicago market. This project would tap the gas reserves of the Green River basin. They say they have the options on leases in that area to assure adequate gas supplies.

* * *

Plans are now on the design boards (delivery schedule 4½ years) for electronic data processing equipment to be used in a gas company's business system that will make such equipment already ordered for installation next year obsolete. The big problem, however, is how to train gas company employees and then keep them up to date with rapid technical advances in this field. The problem will become even more acute.

* * *

Looks like some of Trans-Canada's reserves may be getting away from them. . . . Saskatchewan Power Corp., a crown corporation, wants to parallel the first 250 miles of the still-trying-to-get-started Trans-Canada route. This line may be the first outlet for about 500 billion cu ft of shut-in natural gas in the Many Island Lake field. . . . The Peoples Gas Light & Coke Co. bases its intervention in the TGT-Midwestern hearing on the fact that it joined with Northern Natural in a plan to import gas from Trans-Canada in July 1955, but the Peoples Gas-Northern Natural plan was ignored after TGT acquired substantial stock in Trans-Canada. . . . Hence, Peoples Gas does not oppose importation of Canadian gas. . . . Midwestern claims its price of natural gas in the Chicago area will be 7 cents/Mcf cheaper than the proposed wholesale rate given in the Natural Gas Pipeline Co. of America-Colorado Interstate application . . . this is a significant struggle. . . . Down in Texas, the "keep Texas gas in Texas" movement has been given another shot in the arm by the veto of the Harris bill. Phillips Petroleum Co. has taken the lead by buying 950 acres on the Houston ship channel and setting it aside for a "petrochemical center." . . . The plan, Phillips will make natural gas, water-treating system, rail spurs, etc., available to other companies who will build plants in the center . . . the first taker, Celanese Corp., for their new 40 million lb/year polyolefin resin plant. . . . M. W. Kellogg Co. appears to be another customer as they have purchased 90-odd acres in the center. . . . Phillips gives no reason for the project other than to develop market for their natural gas . . . new INTRASTATE markets could keep gas producers from being regulated by FPC. . . . Ray Fish, Dick Ricketts, et al, tossed another construction inspection tour for personnel of customer companies of the Scenic Inch . . . state officials and press representatives also made the junket that visited current construction spreads near Portland, Ore., and Vancouver, Wash. . . . most of the utility people were impressed by the rough going on the ROW due to heavy rains . . . natural gas is due for turn-in at the Seattle system of Washington Natural Gas Co. on Oct. 1 . . . distribution companies to the south will be getting gas from the Pacific Northwest pipeline sooner . . . current "box score" on the Scenic Inch: 1125 miles in the ground, 150 miles put in during January and February, only 100 miles of ROW left to buy, and they are making three to four miles a day under present (wet) conditions.

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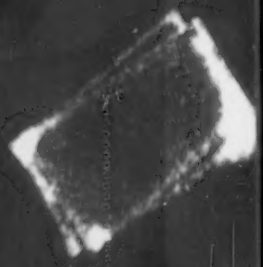
SHARP teeth mean more ditch



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Supreme Court multiplies FPC rate problems

BECAUSE it changed practice concepts, the Supreme Court's recent decision in the Mobile Gas Service rate case hit the Federal Power Commission like an earthquake. Mr. Justice Harlan delivered the opinion of the Court and stated: "We hold that the Natural Gas Act does not give natural gas companies the right to change their rate contracts by their own unilateral action."

Repercussions of Mobile Gas decision

Interstate natural gas pipelines and independent producers, with multi-million dollar contingent rates in force by unilateral action pending final determination by FPC, have shuddered too at the possible impact of the Court's ruling. For illustration, in a current rate hearing before FPC involving the final determination of the rates of a large interstate pipeline company, which has collected increased rates subject to refund, a threat based on the Mobile decision was made by a customer utility to claim the entire rate increase beginning in 1953 was unlawful. If that claim, which would be litigated to the highest court, were finally established as valid, the interstate pipeline company would be bankrupt.

FPC concept reversed

This important Mobile rate problem was processed by the FPC in conformance with its long-established concept of price changing procedure under the Natural Gas Act. Mobile Gas Service Corp., a local distributing company in Mobile, Ala., purchases natural gas from United Gas Pipe Line Co., a natural gas company regulated by FPC. Mobile entered a contract with a cement company to furnish gas for 10 years at 12 cents/Mcf. Before doing this, Mobile obtained from United a contract for 10 years to supply gas to it for resale to the cement company at 10.7 cents/Mcf. United filed this gas sales contract, which had a rate lower than that for other gas furnished, with FPC. This contract was filed as an amendment to the general supply contracts between United and Mobile. With FPC approval, this contract became a part of United's filed schedules of rates and contracts.

In 1953 United, without Mobile's consent, filed new schedules with FPC to increase the rate to 14.5 cents on the gas for resale by Mobile to the cement plant. That rate was closer to the rate for other gas furnished to Mobile by United. Mobile petitioned FPC to reject United's rate increase filing and claimed that United could not unilaterally change the contract rate. The commission denied the petition, holding that under the act the new rate, being a non-suspendible industrial rate, became effective automatically 30 days after filing and would remain in effect until the FPC should investigate and determine that the new rate was unreasonable and therefore unlawful. Mobile paid the new higher rate for about two years, which amounted to about $240,000 more than the original contract price. Mobile appealed and the circuit court reversed FPC and directed it to reject United's filing of the new schedule purporting to increase the rate to Mobile. The circuit court also held Mobile entitled to a refund of the amounts paid in excess of the original contract rate.

Supreme Court's interpretation

The United States Supreme Court affirmed the federal circuit court of appeals. The importance of the Supreme Court's interpretation of the rate-changing procedure under the Natural Gas Act warrants a study of excerpts from the decision. The Supreme Court stated: "The act requires natural gas companies to file all rates and contracts with the commission (Sec. 4(c)) and authorizes the commission to modify any rate or contract which it determines to be 'unjust, unreasonable, unduly discriminatory, or preferential' (Sec. 5(a)). Changes to previously filed rates or contracts must be filed with the commission at least 30 days before they go into effect (Sec. 4(d)), and, except in the case of industrial rates, the commission may suspend the operation of the new rate pending a determination of its reasonableness (Sec. 4(e)). If a decision has not been reached before the period of suspension expires, a maximum of five months, the filed rate must be allowed to go into effect, but the commission's order may be made retroactive to that date.

"In construing the act, we should bear in mind that it evinces no purpose to abrogate private rate contracts as such. To the contrary, by requiring contracts to be filed with the commission, the act expressly recognizes that rates to particular customers may be set by individual contracts. In this respect, the act is in marked contrast to the Interstate Commerce Act, which in effect precludes private rate agreements by its requirement that the rates to all shippers be uniform, a requirement which made unnecessary any provision for filing contracts. See *Armour Packing Co.* v. *United States*, 209 U. S. 56. The Commission in its brief recognizes this basic difference between the two acts and notes the differing natures of the industries which gave rise to it. The vast number of retail transactions of railroads made policing of individual transactions administratively impossible; effective regulation could be accomplished only by requiring compliance with a single schedule of rates applicable to all shippers. On the other hand, only a relatively few wholesale transactions are regulated by the Natural Gas Act and these typically require substantial investment in capacity and facilities for the service of a particular distributor. Recognizing the need these circumstances create for individualized arrangements between natural gas companies and distributors, the Natural Gas Act permits the relations between the parties to be established initially by contract, the protec-

*A monthly commentary on national and state developments by an expert in the field of utility law.

tion of the public interest being afforded by supervision of the individual contracts, which to that end must be filed with the commission and made public.

"The provision of the Natural Gas Act directly in issue here is Sec. 4(d), which provides that 'no change shall be made by any natural-gas company in such (filed) rate . . . or contract . . . except after thirty days' notice to the commission,' which notice is to be given by filing new schedules showing the changes and the time they are to go into effect. It is argued that this provision authorizes a natural gas company to change its rate contracts simply by filing a new schedule of rates, to go into effect in no less than thirty days. On its face, however, Sec. 4(d) is simply a prohibition, not a grant of power. It does not purport to say what is effective to change a contract, any more than Sec. 4(c) purports to define what constitutes a 'contract' that may be filed with the commission. The section says only that a change *cannot* be made without the proper notice to the commission; it does not say under what circumstances a change *can* be made. Absent the act, a unilateral announcement of a change to a contract would of course be a nullity, and we find no basis in the language of Sec. 4(d) for inferring that the mere imposition of a filing-and-notice requirement was intended to make effective action which would otherwise be of no effect at all. In short, Sec. 4(d) on its face indicates no more than that otherwise valid changes cannot be put into effect without giving the required notice to the commission. To find in the section a further purpose to empower natural gas companies to change their contracts unilaterally requires reading into it language that is neither there nor reasonably to be implied."

Contingent increases

Concerning the contingent increased rates allowed by FPC in all cases after the suspension time has elapsed, and currently involving many millions of dollars, the Court interpreted the Natural Gas Act thus:

"The powers of the Commission are defined by Secs. 4(e) and 5(a). The basic power of the commission is that given it by Sec. 5(a) to set aside and modify any rate or contract which it determines, after hearing, to be 'unjust, unreasonable, unduly discriminatory, or preferential.' This is neither a 'rate-making' nor a 'rate-changing' procedure. It is simply the power to review rates and contracts made in the first instance by natural gas companies and, if they are determined to be unlawful, to remedy them. Sec. 5(a) would of its own force apply to *all* the rates of a natural gas company, whether long-established or newly changed, but in the latter case the power is further implemented by Sec. 4(e). All that Sec. 4(e) does, however, is to add to this basic power, in the case of a newly changed rate or contract (except 'industrial' rates), the further powers (1) to preserve the status quo pending review of the new rate by suspending its operation for a limited period and (2) thereafter to make its order retroactive, by means of the refund procedure, to the date the change became effective. The scope and purpose of the commission's review remain the same—to determine whether the rate fixed by the natural gas company is lawful."

Conclusions

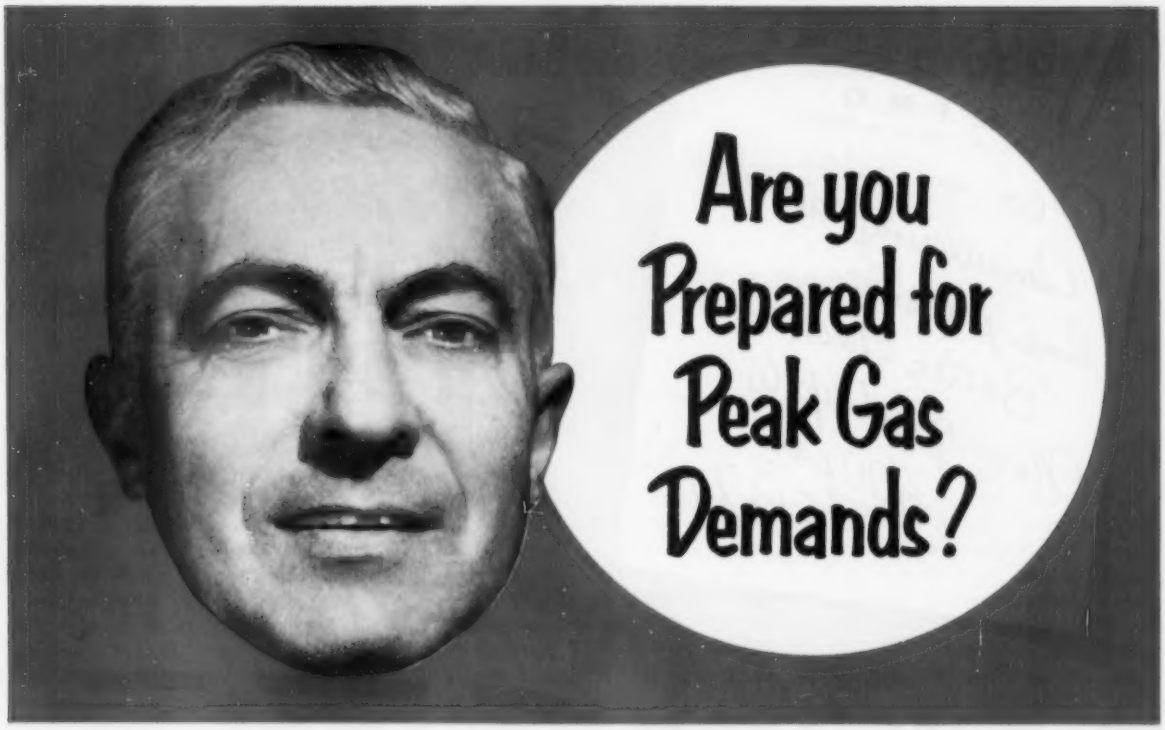
The Supreme Court concluded that its interpretation of the act showed a coordination of the conflicting interests of contract permanence and public utility regulation to establish reasonable rates reflecting current economic conditions. The court declared: "In short, the act provides no 'procedure' either for making or changing rates; it provides only for *notice* to the commission of the rates established by natural gas companies and for *review* by the commission of those rates. The initial rate-making and rate-changing powers of natural gas companies remain undefined and unaffected by the act.

"All of the relevant provisions of the act can thus be fully explained as simply defining and implementing the powers of the commission to review rates set initially by natural gas companies, and there is nothing to indicate that they were intended to do more. Admittedly the act presumes a capacity in natural gas companies to make rates and contracts and to change them from time to time, but nowhere in the act is either power defined. The obvious implication is that, except as specifically limited by the act, the rate-making powers of natural gas companies were to be no different from those they would possess in the absence of the act: to establish *ex parte*, and change at will, the rates offered to prospective customers; or to fix by contract, and change only by mutual agreement, the rate agreed upon with a particular customer. No more is necessary to give full meaning to all the provisions of the act: consistent with this, Sec. 4(d) means simply that *no* change—neither a unilateral change to an *ex parte* rate nor an agreed-upon change to a contract—can be made by a natural gas company without the proper notice to the commission. Hence there is nothing in the structure or purpose of the act from which we can infer the right, not otherwise possessed and nowhere expressly given by the act, of natural gas companies unilaterally to change their contracts.

"Our conclusion that the Natural Gas Act does not empower natural gas companies unilaterally to change their contracts fully promotes the purpose of the act. By preserving the integrity of contracts, it permits the stability of supply arrangements which all agree is essential to the health of the natural gas industry. Conversion by consumers, particularly industrial users, to the use of natural gas may frequently require substantial investments which the consumer would be unwilling to make without long-term commitments from the distributor, and the distributor can hardly make such commitments if its supply contracts are subject to unilateral change by the natural gas company whenever its interests so dictate. The history of the Ideal contract furnishes a case in point. On the other hand, denying to natural gas companies the power unilaterally to change their contracts in no way impairs the regulatory powers of the commission, for the contracts remain fully subject to the paramount power of the commission to modify them when necessary in the public interest. The act thus affords a reasonable accommodation between the conflicting interests of contract stability on the one hand and public regulation on the other.

"It may be noted also that this interpretation, while precluding natural gas companies from unilaterally changing their contracts simply because it is in their private interests to do so, does not deprive them of an avenue of relief when their interests coincide with the public interest. Sec. 5 (a) authorizes the commission to investigate rates not only upon complaint of any state, municipality, state commission, or gas distributing company' but also 'upon its own motion.' Thus, while natural gas companies are understandably not given the same explicit standing to complain of their own contracts as are those who represent the public interest or those who might be discriminated against, there is nothing to prevent them from furnishing to the commission any relevant information and requesting it to initiate an investigation on its own motion. And if the commission, after hearing, determines the contract rate to be so low as to conflict with the public interest, it may under Sec. 5(a) authorize the natural gas company to file a schedule increasing the rate."

This Supreme Court decision will breed litigation, renegotiation of gas supply contracts subject to FPC and probably more legislation. ■



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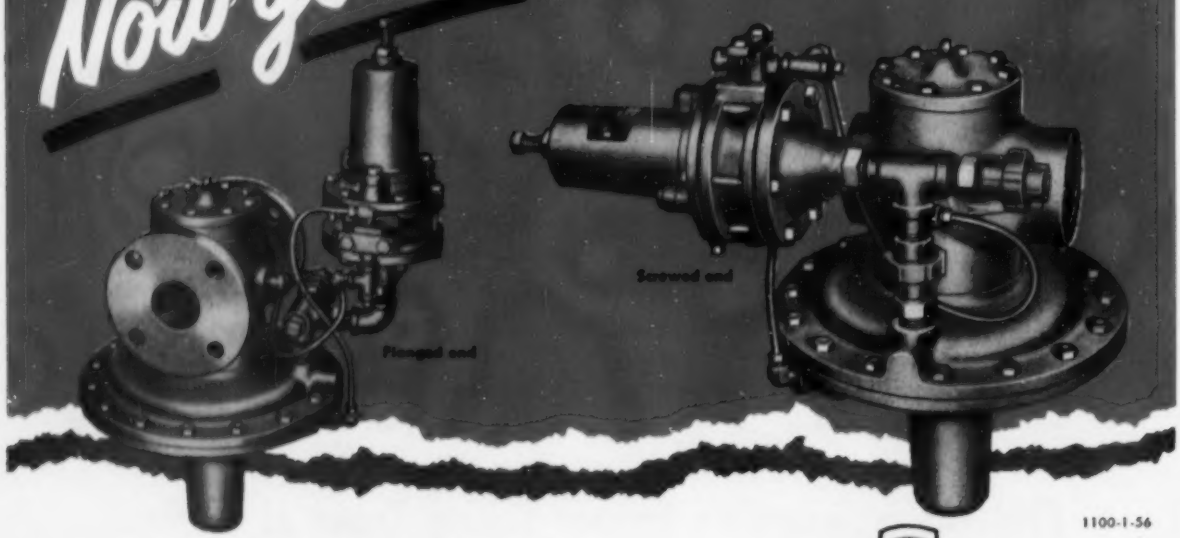

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WASHINGTON

Midwestern Gas proposal faces stiff battle for FPC approval

WASHINGTON in the month of April was a city festooned with cherry blossoms and equally flowery hearings in the chambers of the FPC. One was a vision of nature's beauty while the other was a vision of the beauty of words produced when some of the gas industry's major operations are under Federal control. Gasmen in the nation's capitol seemed resigned to the fact that gas production and transmission companies are destined to be constantly involved—in one way or another—with hearings before the FPC. It is the nature of the gas business today.

The prime battle being given the full treatment is the FPC Docket G-9448, et al, the complicated application involving Tennessee Gas Transmission Co., Midwestern Gas Transmission Co., Iron Ranges Natural Gas Co. and intervenors by the scores. The matter involved is import-export arrangements for Canadian and U. S. natural gas and Midwestern's proposed construction of a new pipeline from the international boundary in Minnesota to connect with existing pipelines of TGT in Tennessee. Washington experts on such matters are saying that this hearing will be a record setter. Some estimate the duration of the proceedings on the several applications in terms of years.

Will Midwestern Gas Transmission get a certificate? Some observers say they will get a certificate of *some kind* —they can't get together on just how the alleged certificate will lash-up the many factors involved. Reasoning behind such predictions is based on the assumption that the long-delayed Trans-Canada pipeline's fate hinges on the establishment of markets that could be created by Midwestern's plant. And, under the new ownership arrangements made for Trans-Canada, two very powerful contenders join TGT in controlling 51% of Trans-Canada Pipeline Co. Ltd.—Canadian Gulf Oil Co. (subsidiary of Gulf Oil Corp.) and Hudsons Bay Oil & Gas Co. Ltd. (affiliated with Continental Oil Co.). It is felt that Gulf Oil may be particularly adroit in gaining the objectives of Trans-Canada through some measure of certification for Midwestern. This, however, remains to be seen. Here in Washington it looks as if the Trans-Canada pipeline will have rough going even with the impetus of TGT, Gulf, and Conoco backing.

The question in Washington and Ottawa is—will Trans-Canada lose its permit if it fails to exhibit financing before the Nov. 1, 1956 deadline or will the Canadian government extend the interim permit for the fourth time? Also, to be answered—will Trans-Canada be able to raise the needed financing with the assistance of Tennessee Gas Transmission and/or Canadian Gulf Oil? Various members of the Canadian cabinet have rendered statements to the effect that there is definite opposition to extending the deadline again. Officials of Trans-Canada feel confident that Hudson Bay's and Canadian Gulf's participation will smooth the way for financing and constructing the line. In any case, it looks like another construction season has been lost by Trans-Canada.

Industry resigned to living with FPC

Gas producers are now casting about for the most advantageous way to live with and under FPC regulation following President Eisenhower's veto of the Harris-Fulbright bill. It is not news to the gas industry that the probability of attempting passage of another bill to free gas producers from Federal control is rather slim for this year. Most observers say another effort this year is remote.

FPC appears to have no formulated program for administering the regulation of gas producers. Obviously, they were caught as short as the producers were by the action of the President. FPC seems inclined to do little other than evolve policy by learning to walk by walking—treating each case individually and taking it slow and easy, case by case. Policy will probably be designed to allow for fast switches.

Old Washington heads feel the present law will be shown to be unworkable. It is reported that two of the FPC commissioners are of the opinion that gas producers cannot be regulated like public utilities as a practical operation. One of the five commissioners seems to feel that the law will work, another apparently is undecided, and the remaining commissioner is relatively inactive due to illness.

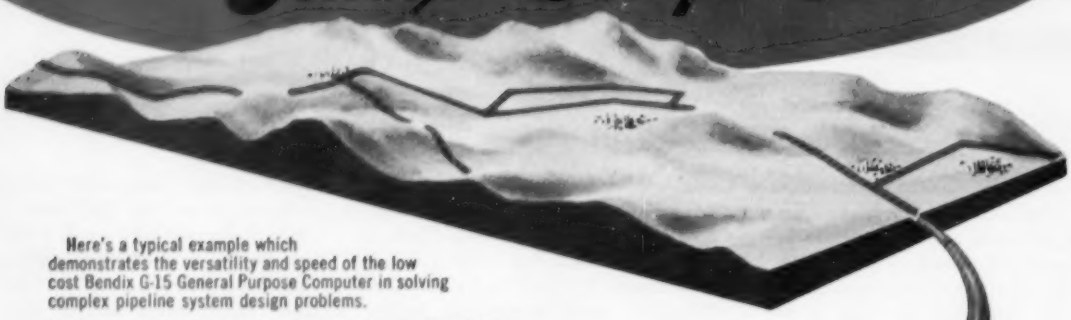
The 40-plus cases that producers have taken to Federal courts to test or challenge specific FPC orders will be long, drawn-out legal battles and the snarl they create may well demonstrate the unworkability of the current approach.

FPC's big problem: how do you formulate prices for natural gas from producers? Nobody seems to know. Utilities operate under a depreciated rate base that sluffs off assets, but this type of rate making seems impractical for

Continued on page 97

GIVES THE ANSWER TO PIPELINE DIFFERENTIAL PRESSURES...IN SECONDS!

Bendix Computer



Here's a typical example which demonstrates the versatility and speed of the low cost Bendix G-15 General Purpose Computer in solving complex pipeline system design problems.

A proposed system of pipelines 160 miles long with 1800 feet variation in altitude, was to consist of a number of pipes of different diameters running in parallel over eleven given sections. At the end of the sections, gas was to enter the flow from another source or be branched off to another destination. In addition, two compressors were to be placed at various sections along the line.

6 SECONDS TO SOLVE EACH STATION

After the problem has been entered into the Computer only 6 seconds per section are required to solve and print the answer for each station, giving pipeline pressure, flow rate of the gas and the mile posts.

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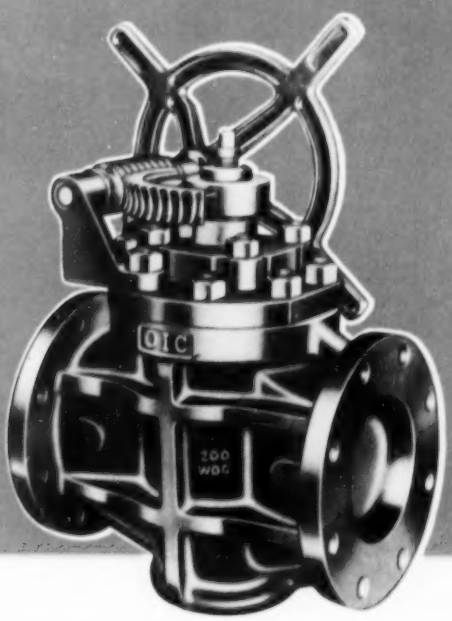

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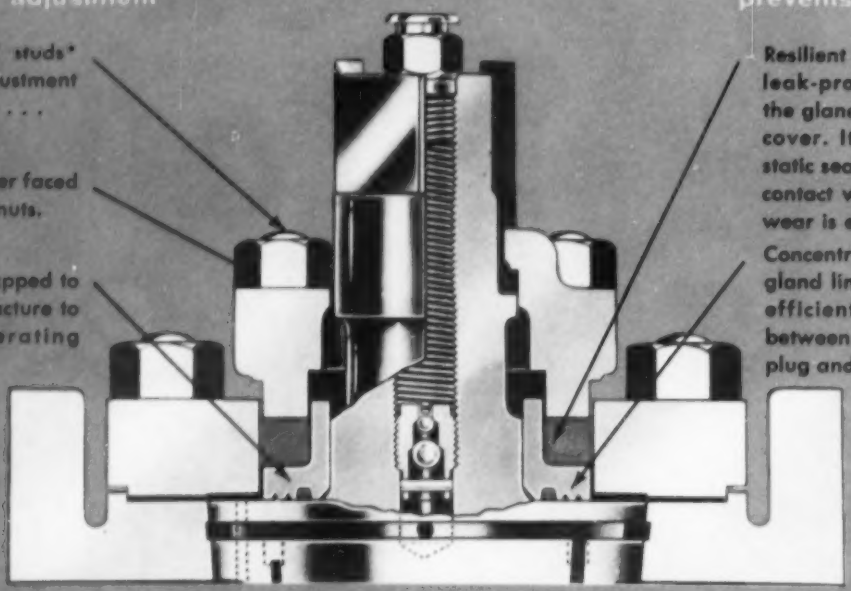
Exclusive New OIC Gland Design Retains Adjustment . . . Without Leaks

How OIC's new gland design preserves adjustment

Fine thread gland studs* permit precise adjustment in conjunction with . . .

Semi-finished washer faced gland adjustment nuts.

A gland liner* is lapped to the plug in manufacture to assure low operating torque.



How OIC's new gland design prevents leaks

Resilient packing forms a leak-proof seal between the gland, gland liner, and cover. It is a completely static seal. Since there is no contact with moving parts, wear is eliminated.

Concentric grooving in the gland liner face* forms an efficient "labyrinth" seal between the top face of the plug and the gland liner.

Accurate gland adjustment affords a proper lubricant film between plug and body to assure pressure tight seating and continuous ease of operation. This precise adjustment is maintained by OIC's exclusive design which isolates the packing from all moving parts.

***4" and up**

These three seals: resilient packing, grooving, and O-ring act separately from the valve's lubrication system to prevent leakage at the valve shank. However, the lubrication system does provide its own seal, since lubricant grooving on the plug surrounds both body ports of the valve, and along with lube film on plug surface seals off line flow from the upper portions of the valve.

Important additional features of new OIC lubricated plug valves

All OIC lubricated plug valves can be furnished with lube screw, buttonhead fitting or combination lube screw-buttonhead fitting, as specified.

Visible stop on plug shows opened or closed position of plug at a glance.

Pinned double-ball check valve at bottom of plug shank eliminates blow-outs when lube screw or lube fitting is removed. Pinning prevents loss of balls into lubrication system under high pressure lubrication.

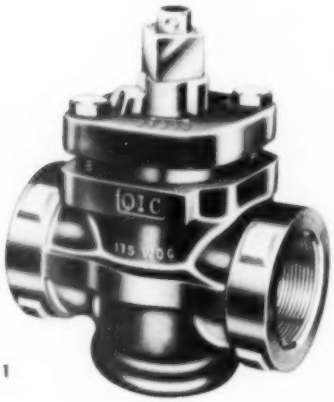
Four vertical lubricant grooves assure adequate lubrication around port areas:

Two grooves 180° apart do not cross body ports in operation.

Two grooves 180° apart cross body ports in operation, but are combined with lubrication supply through eight jump grooves in the body only when plug is in fully opened or closed positions. This system permits valve lubrication maintenance when valve is in either position. In intermediate positions these grooves are disconnected from lubrication system preventing undue loss of lube into line.

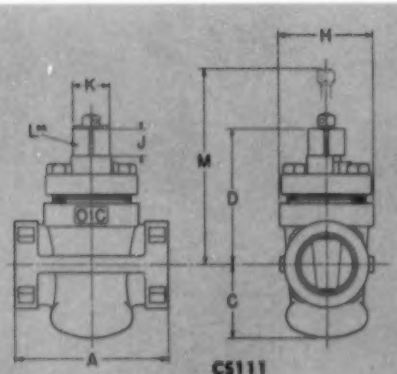
Fig. Nos. CS111, CS112
175 Pound W.O.G.
300 Pound Test

OIC Lubricated Plug Valves

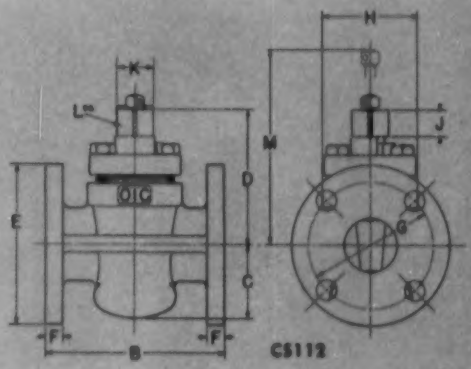


CS111

CS112



CS111



CS112

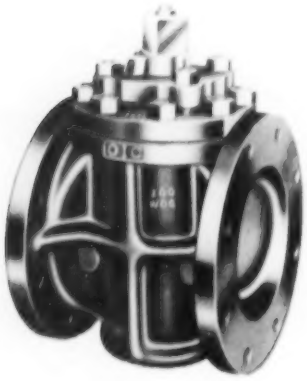
General Dimensions

Size of Valve, in Inches	1"	1¼"	1½"	2"	2½"	3"	4"
A—End to End, Fig. No. CS111	3⅜	5	5	5⅞	7	7⅜	9
B—Face to Face, Fig. No. CS112	5½	—	6½	7	7½	8	9
C—Center Line to Bottom of Body	1 31/32	2⅛	2⅛	2¾	3¾	3¾	4 11/32
D—Center Line to Top of Plug Shank	3 13/32	3 13/16	3 13/16	5 1/16	5 13/16	6¼	7 5/16
E—Diameter of Flanges	4¼	—	5	6	7	7½	9
F—Thickness of Flanges	3/8	—	7/16	9/16	11/16	¾	15/16
G—Flange Bolt Circle	3⅛	—	3⅞	4¾	5½	6	7½
Number and Size of Bolts	4-½	—	4-½	4-⅝	4-⅝	4-⅝	8-⅝*
H—Maximum Width of Body	2¾	3	3	3½	4¼	5	6
J—Height of Square on Shank**	⅝	¾	¾	1	1¼	1¼	1¼
K—Diameter of Shank (Wrench Portion)	⅞	1 3/16	1 3/16	1 13/32	1 5/8	1 13/16	2 1/32
L—Width of Square on Shank**	11/16	29/32	29/32	1 1/16	1 1/16	1 3/16	1 13/32
M—Clearance Required for Lubricator	5¼	6¼	6¼	7⅜	8¼	9 15/16	10⅞
Malleable Iron Wrench	MW-1	MW-2	MW-2	MW-3	MW-4	MW-5	MW-6
Bronze Wrench	BW-1	BW-2	BW-2	BW-3	BW-4	BW-5	BW-6
Combination Wrench and Locking Device Assembly	MCW-13	MCW-23	MCW-23	MCW-33	MCW-42	MCW-52	MCW-62
Locking Device Assembly	LD-13	LD-23	LD-23	LD-33	LD-42	LD-52	LD-62
2" Square Head Adapters	FA-1	SA-2	SA-2	SA-3	SA-4	SA-5	SA-6
Giant Button Head Gun Fitting	GF-18	GF-14	GF-14	GF-14	GF-14	GF-38	GF-38
Lube Screw	LS-18	LS-14	LS-14	LS-14	LS-14	LS-38	LS-38
Comb. Lube Screw-Gun Fitting	CLS-18	CLS-14	CLS-14	CLS-14	CLS-14	CLS-38	CLS-38
Size of Lubricant Stick	B	B	B	B	C	C	D

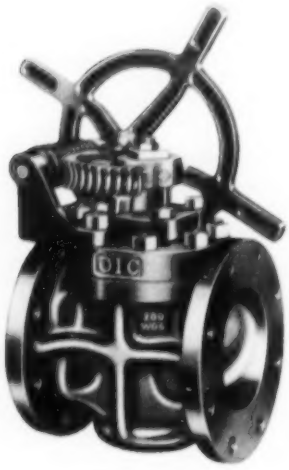
*Due to space limitations, the two top flange holes are tapped for studs or cap screws.
**Flat instead of square, 1" size only.

Fig. Nos. CS212, CS222, CS232, CS242
200 lb. wog 400 lb. test

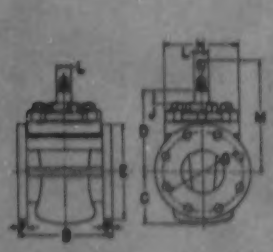
OIC Lubricated Plug Valves



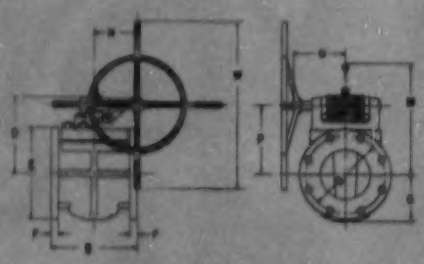
CS212



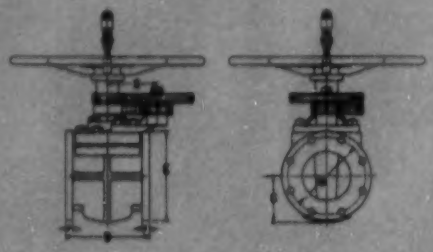
CS222



CS212



CS222



CS232

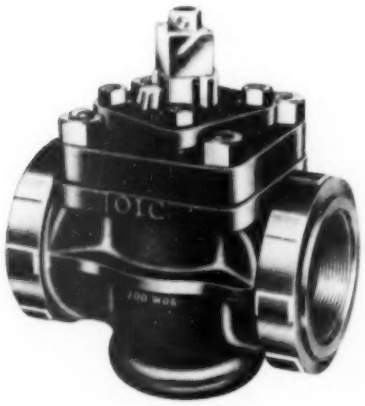
Fig. CS242—Spur Gear with Housing (Same dimensions as Fig. CS232)

General Dimensions

Size of Valve, Inches	6"	8"	10"	12"
B—Face to Face CS 212, CS 222, CS 232, CS242	10½	11½	13	14
C—Center to Bottom of Body	5⅛	7⅛	8⅜	10⅛
D—Center to Top of Plug Shank	9¹³⁄₁₆	11⅞	14⅛	16¹³⁄₁₆
E—Diameter of Flange	11	13½	16	19
F—Thickness of Flange	1	1⅛	1¼	1¼
G—Flange Bolt Center	9½	11¾	14¼	17
Number and Size of Bolts	8-¾	8-¾	12-⅞	12-⅞
H—Maximum Width of Body	8½	10	11¾	13
J—Height of Square on Shank	1¾	2	2⅛	2⅛
L—Width Across Square on Shank	1¾	2	2	2¾
M—Clearance to Remove Lubricator	14⅛	16¹¹⁄₁₆	19¾	21⅝
N—Center of Valve to Center Handwheel	5⅜	5⅜	6⅝	6⅝
O—Center of Valve to End of Shaft	8¼	7⅞	7⅞	7¼
P—Center of Port to Center Handwheel	8¹³⁄₁₆	10¹³⁄₁₆	13¼	15¾
W—Diameter of Handwheel—Worm Operated	20	20	24	24
Heavy Duty Steel Wrench	SW-8	SW-10	SW-10	SW-11
Bronze Wrench	BW-8	BW-10	BW-10	BW-11
Combination Wrench and Locking Device	SCW-82	—	—	—
Locking Device Assembly	LD-82	LD-92	—	—
2" Square Head Adapters	SA-8	—	—	SA-11
Giant Buttonhead Gun Fitting	GF-12	GF-12	GF-12	GF-12
Combination Lube Screw Replaces Buttonhead Fitting when specified	CLS-12	CLS-12	CLS-12	CLS-12
Lube Screw Replaces Buttonhead Fitting when specified	LS-12	LS-12	LS-12	LS-12
Size of Lubricant Stick	D	G	G	G

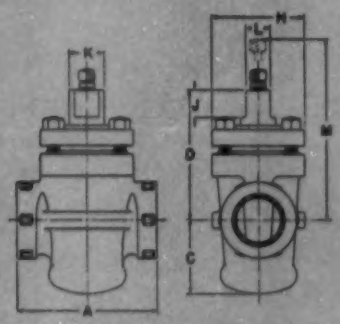
OIC Lubricated Plug Valves

Fig. Nos. CR211, CR212,
200 Pound W.O.G.
400 Pound Test



CR211

CR212



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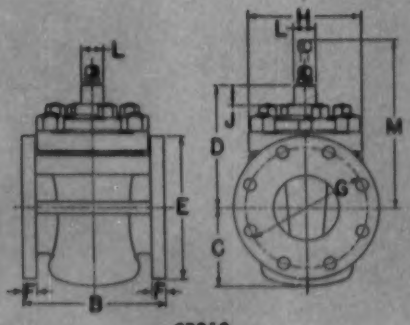


CR212

General Dimensions

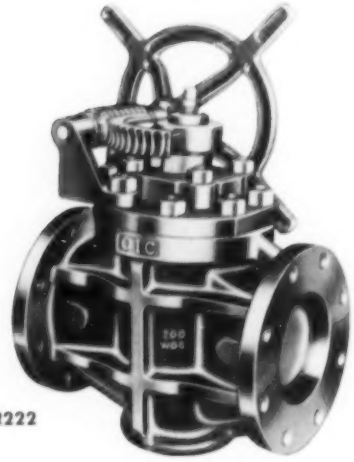
Size of Valve, in Inches	½"	¾"	1"	1¼"	1½"	2"	2½"	3"	4"
A—End to End, Fig. No. CR211	3¼	3¼	4	5⅛	5⅛	6¼	7¼	8⅝	11
B—Face to Face, Fig. No. CR212	—	—	5½	—	6½	7½	8¼	9	9
C—Center Line to Bottom of Body	1 21/32	1 21/32	2⅛	2⅛	2¾	3⅜	3¾	4 11/32	4⅞
D—Center Line to Top of Plug Shank	3 13/32	3 13/32	3 15/16	3 15/16	5¼	5 15/16	6¼	7 29/32	7½
E—Diameter of Flanges	—	—	4¼	—	5	6	7	7½	9
F—Thickness of Flanges	—	—	7/16	—	9/16	⅝	11/16	¾	15/16
G—Flange Bolt Circle	—	—	3⅛	—	3⅞	4¾	5½	6	7½
Number and Size of Bolts	—	—	4-½	—	4-⅝	4-⅝	4-⅝*	4-⅝*	8-⅝*
H—Maximum Width of Body	2¾	2¾	3	3	3⅝	4¼	5	6	7
J—Height of Flat on Shank	⅜	⅜	¾	¾	1	1¼	1¼	1¼	1¼
K—Diameter of Shank	⅞	⅞	1 5/32	1 5/32	1 13/32	1 15/32	1 23/32	1 31/32	1 31/32
L—Width Across Flat of Shank	11/16	11/16	⅞	⅞	1	1⅛	1¼	1⅜	1⅜
M—Clearance Required for Lubricator	5¼	5¼	6¼	6¼	7⅜	8¼	9 13/16	10 25/32	11¼
Malleable Iron Wrench	MW-1	MW-1	MW-2	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7
Bronze Wrench	BW-1	BW-1	BW-2	JW-2	BW-3	BW-4	BW-5	BW-6	BW-7
Heavy Duty Steel Wrench	—	—	SW-2	SW-2	SW-3	SW-4	SW-5	SW-6	SW-7
Combination Wrench and Locking Device Assembly	MCW-13	MCW-13	MCW-23	MCW-23	MCW-33	MCW-42	MCW-52	MCW-62	MCW-72
Locking Device Assembly	—	—	LD-13	LD-23	LD-23	LD-33	LD-42	LD-52	LD-62
2" Square Adapters	FA-1	FA-1	FA-2	FA-2	FA-3	FA-4	FA-5	FA-6	FA-7
Giant Buttonhead Gun Fitting	GF-18	GF-18	GF-14	GF-14	GF-14	GF-14	GF-38	GF-38	GF-38
Lube Screw	LS-18	LS-18	LS-14	LS-14	LS-14	LS-14	LS-38	LS-38	LS-38
Comb. Lube Screw and Gun Fitting	CLS-18	CLS-18	CLS-14	CLS-14	CLS-14	CLS-14	CLS-38	CLS-38	CLS-38
Size of Lubricant Stick	B	B	B	B	B	C	C	D	D

*Due to space limitations, the two top flange holes are tapped for studs or cap screws.

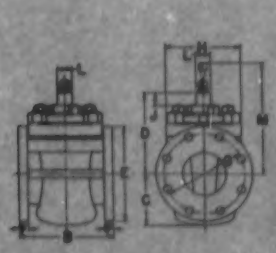
Fig. Nos. CR212, CR222, CR232, CR242
200 lb. wog 400 lb. test

OIC Lubricated Plug Valves

CR212



CR222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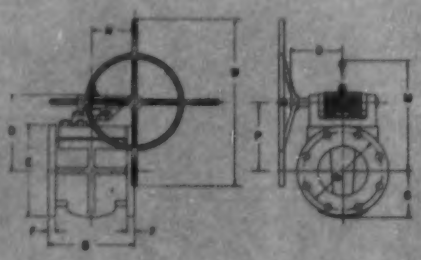

CR222

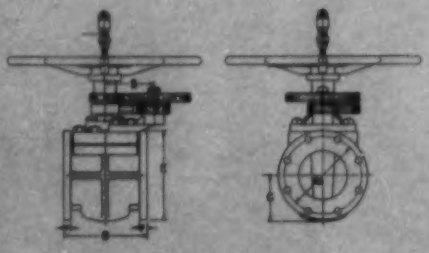

CR232

Fig. CR242—Spur Gear with Housing
(Same dimensions as Fig. CR232)

General Dimensions

Size of Valve, Inches	6"	8"	10"	12"
B—Face to Face CR212, CR222, CR232, CR242	15½	18	21	24
C—Center to Bottom of Body	7⅛	8⅜	10⅜	12
D—Center to Top of Plug Shank	11⅞	14⅜	16 13⁄16	17 11⁄16
E—Diameter of Flange	11	13½	16	19
F—Thickness of Flange	1	1⅛	1⅜	1¼
G—Flange Bolt Center Circle	9½	11¾	14¼	17
Number and Size of Bolts	8-¾	8-¾	12-⅞	12-⅞
H—Maximum Width of Body	10	11¾	13	16⅞
J—Height of Square on Shank (CR212)	2	2⅛	2½	1⅝
K—Diameter of Shank (CR212)	2 23⁄32	2⅝	3⅛	3½
L—Width Across Square on Shank (CR212)	2	2	2⅜	2¾
M—Maximum Clearance to Remove Lubricator (CR222)	16 1⁄16	19 7⁄16	21⅝	22½
M—Maximum Clearance to Remove Lubricator (CR232)	26½	28⅞	31 1⁄16	—
N—Center of Valve to Center Handwheel	5 11⁄64	6 11⁄32	6 11⁄32	10⅝
O—Center of Valve to End of Shaft	7⅝	7⅝	7¼	12¾
P—Center of Port to Center Handwheel	10 13⁄16	13¼	15¾	16½
W—Diameter of Handwheel	20	24	24	29
Heavy Duty Steel Wrench	SW-10	SW-10	—	—
Bronze Wrench	BW-10	BW-10	—	—
Locking Device Assembly	LD-92	—	—	—
Giant Buttonhead Gun Fitting	GF-12	GF-12	GF-12	GF-12
Lube Screw	LS-12	LS-12	LS-12	LS-12
Comb. Lube Screw and Gun Fitting	CLS-12	CLS-12	CLS-12	CLS-12
Lubricant Stick Size	G	G	H	H

Lubricants

Functions
Specifications
Service Recommendations

Functions of Lubricant

1. The valve seat must be kept lubricated for easy operation, so the lubricant must be of proper viscosity, yet function as an effective seal over a wide temperature range.

2. It must have proper plasticity and resistance to solvents and chemicals to form an effective and lasting film seal around each port. This film protects the seating surfaces, and along with the lubricant in the vertical grooves, prevents leakage between plug and body.

3. The lubricant comprises the hydraulic means for jacking the plug from its tapered seat if it becomes necessary to free the plug.

Specifications

Stick		For Screw Type Lubricator Sold By Box Only						For Gun Lubricator Sold By Box		
Sticks Per Box		24	24	24	24	24	12	6	12	72
Number	Color	A	B	C	D	G	H	K	J	R
400	Red	¼" x 1"	⅜" x 1½"	⅞" x 2⅛"	½" x 2⅝"	⅝" x 3½"	⅞" x 4½"	1½ x 12"	1½ x 12"	1½" x 12"
600	Amber	"	"	"	"	"	"	"	"	"
650	Blue	"	"	"	"	"	"	"	"	"
750	Black	"	"	"	"	"	"	"	"	"

Bulk		For Gun Lubricator			
		Sold By Gallon		Sold Per Pound Only In	
Number	Color	1 Gallon (8 Lb.)	1 Pound	60 Pound	100 Pound
350	Yellow	———	———	Can Furnish	Can Furnish
375	Yellow	———	———	" "	" "
400S	Red	Can Furnish	———	" "	" "
600S	Amber	" "	———	" "	" "
625S	Yellow	" "	———	" "	" "
650S	Blue	" "	———	" "	" "
750S	Black	" "	———	" "	" "
44	Amber	———	Can Furnish	———	———

Service Recommendations

Lubricant Number	Temperature Range		Service Recommendation
400	10° F	480° F	Acids, Alcohols, Alkalies, Foodstuff, Vegetable Dyes, Water, Nitrating Acids, Caustics, Acid and Hydrocarbon Mixtures, Chlorines, Etc.
600	— 40° F	500° F	General All Purpose Hydrocarbon Lubricant, Acetate Solvents, Acetone, Air, Alcohol, Ammonia, Aniline Dye, Black, Green or White Liquor, Blast Furnace Gas, Coke Oven Gas, Crude Oil, Gasoline, Natural or Manufactured Gases, Petroleum Oil, Sewage, Salt Solutions, Etc.
650	— 50° F	300° F	Gasoline, Kerosene, Naphthas, Propane, Etc.
750	400° F	900° F	Use on High Temperature Hydrocarbons such as Asphalt and Hot Gas.
350	0° F	450° F	Hydrofluoric Acid only.
375	20° F	300° F	Furfural Service only.
400S	10° F	480° F	Same as 400
600S	— 40° F	500° F	Same as 600
625S	— 10° F	300° F	Aviation Gasoline and Jet Fuel.
650S	— 50° F	300° F	Same as 650
750S	400° F	900° F	Same as 750
44	— 10° F	300° F	Aviation Gasoline and Jet Fuel.

Accessories

Wrenches
Locking Devices
Lube Accessories

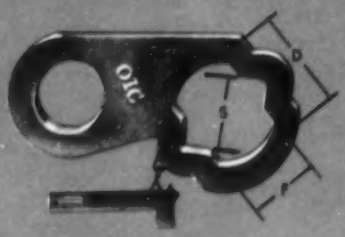
MALL. IRON WRENCH, MW SERIES
BRONZE WRENCH, BW SERIES

LUBRICANT GUN—FIG. No. LG-100

LUBE SCREW
LS SERIES

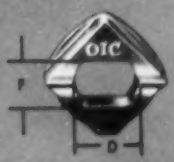
COMBINATION LUBE SCREW
AND GUN FITTING
CLS SERIES

MALLEABLE IRON, MCW-1 THROUGH MCW-7
CAST STEEL, SCW-8 AND UP

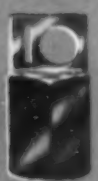


LOCKING DEVICE—LS SERIES

2" SQ. HEAD ADAPTER
SA SERIES



2" SQ. HEAD ADAPTER
FA SERIES


LOCKING NUT
FOR LOCKING DEVICE

GIANT BUTTONHEAD
GUN FITTING

High head and low head extensions, as well as remote control devices, floor stands and road boxes, are also available.

DIMENSIONS

MCW & SCW SERIES		FA & SA SERIES		LN & LD SERIES			MW & BW SERIES					LS, CLS & GF SERIES			
WRENCH No.	LENGTH L	ADAPTER No.		LOCKING NUT	COMB. WRENCH	LOCKING DEVICE	WRENCH No.		LENGTH L	FLAT FXD	SQUARE S	No.	No.	No.	I. P. SIZE
MCW-1	7"	FA-1	—	LN-1	MCW-1	LD-1	MW-1	BW-1	5½"	4 3/64 x 1 3/16	—	LS-18	CLS-18	GF-18	⅛"
MCW-2	7"	FA-2	SA-2	LN-2	MCW-2	LD-2	MW-2	BW-2	6"	5 3/64 x 1¼	6 1/64	LS-14	CLS-14	GF-14	¼"
MCW-3	9"	FA-3	SA-3	LN-3	MCW-3	LD-3	MW-3	BW-3	9"	1 1/64 x 1½	1 3/64	LS-38	CLS-38	GF-38	⅜"
MCW-4	12"	FA-4	SA-4	LN-4	MCW-4	LD-4	MW-4	BW-4	12"	1 3/64 x 1 31/32	1 19/64	LS-12	CLS-12	GF-12	½"
MCW-5	15"	FA-5	SA-5	LN-5	MCW-5	LD-5	MW-5	BW-5	15"	1 13/64 x 1 27/32	1 31/64	—	—	—	—
MCW-6	18"	FA-6	SA-6	LN-6	MCW-6	LD-6	MW-6	BW-6	18"	1 25/64 x 2 1/32	1 41/64	—	—	—	—
MCW-7	24"	—	SA-7	LN-7	MCW-7	LD-7	MW-7	BW-7	24"	1 25/64 x 2 1/32	—	—	—	—	—
SCW-8	24"	—	SA-8	LN-8	SCW-8	LD-8	—	—	—	—	1 13/16	—	—	—	—
—	—	—	—	LN-9	—	LD-9	—	—	—	—	—	—	—	—	—

Comparison

All comparisons listed in this chart are derived from the latest available valve manufacturers' catalogs. Figure numbers shown represent those valves which come nearest to being similar, with respect to general design, construction and rating. In some of the comparisons there are minor differences in design and materials, which differences may be determined by reference to catalogs of the individual manufacturer and to OIC.

OIC	Nordstrom	Walworth
CS111	142	1796
CS112	143	1797-F
CR211	114	1700
CS211	—	1700
CR212	115	— —
CS212	143	1718-F
CS222	149	1727-F
CS232	—	— —
CS242	—	— —
CR212	165	1700-F
CR222	169	1707-F
CR232	167	1702-F
CR242	—	— —

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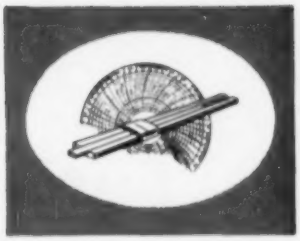
technical trends



• By GUY CORFIELD

Economic danger ahead

On Jan. 30-31 Stanford Research Institute conducted an Industrial Economic Conference in Los Angeles, devoted to "Company Planning and Technology." It was concerned with the long-range planning functions in contemporary business activities in the light of the general predictions that, failing global war or other disastrous developments, we are due for unprecedented further progress and prosperity in the years ahead; the view of some observers that the present situation is more in the nature of an avalanche hurtling to collapse and destruction; and the probability that, through careful planning in all segments of business, major difficulties can be avoided and the expected increased benefits realized in large measure.

In one of the addresses Gerhard Colm, chief economist, National Planning Association, under the title of "Technology and Economic Progress," developed "six specific problem areas through which we will have to navigate in order to enjoy smooth sailing to the land of plenty." These areas were:

(1) *To develop productive capacity and active demand in the proper proportion* — so as to avoid serious business cycles, periods of depression, etc.

(2) *To avoid inflationary cost rises* — which might be accomplished through yearly meetings between national representatives of management and labor, "to discuss the general wage policy desirable to support purchasing power without creating undue pressure for cost and price rises."

(3) *To avoid technological unemployment and to adapt the labor force to the requirements of increased mechanization and automation* — because "it appears likely that at some time in the future the effect of automation as a substitute for labor will exceed its job-creating effect."

(4) *To deal with particular sections and communities in the country and with particular groups of low-income people who do not share in the benefits of the general technological advances* — by provision of special assistance to areas that remain depressed and to handicapped and sub-standard workers.

(5) *To avoid an excessive concentration of economic power* — whereby big business may get bigger and small business be forced to the wall.

(6) *To preserve our natural resources which, through exhaustion, may hinder rapid economic development* — which resources would include soil and water, minerals, and fuels.

The proceedings of this conference, comprising thirteen addreses, can be obtained at a cost of $3.50 by writing Industrial Economics Conference, Stanford Research Institute, Menlo Park, Calif.

Reinforced plastic pressure vessels

When the chemist wants to take or store a sample under pressure he has of necessity resorted to a metal container and is often confronted with the problem of reaction of the sample with the metal to cause corrosion of the container or deterioration or contamination of the sample. A typical problem in the gas industry is the handling of gas samples containing sulfur compounds. Plastic linings, stainless steel, and aluminum have helped, but for accurrate work the stability of the sample is always under question.

A solution to this problem may be found in the development of a reinforced plastic pressure vessel recently announced by Walter Kidde & Co. Inc., 1028 Main St., Belleville 9, N. J.

The vessel was primarily devised for military aircraft as a reservoir for actuating pneumatic systems. It is made of glass fiber impregnated with epoxy resin, either by winding the fiber about a mandrel or laying layers of glass cloth onto a frame; the entire assembly is cured in an oven and then the mandrel or frame, of low melting material, is removed by melting with low pressure steam.

For equal size and strength, the glass-resin container weighs 36% less than a steel container. The price so far is considerably greater than steel, so that only special purpose use is indicated. It is claimed that the glass-resin containers can withstand 20,000 cycles or pressuring and emptying. Kidde can presently supply them ranging in volume from 50 to 4000 cu in., capable of standing pressures up to 5000 psi.

Cost of drilling oil wells

The question is often asked: How much does it cost to drill an oil well and prepare it for production? The American Petroleum Institute, the Independent Petroleum Association of America, and the Mid-Continent Oil & Gas Association have made a comprehensive survey of reported costs and developed an answer that is not simple or specific, because of the many variables such as location, types of strata penetrated and depth of well, but does give certain averages and limits that are of interest. The data apply only to the U. S.

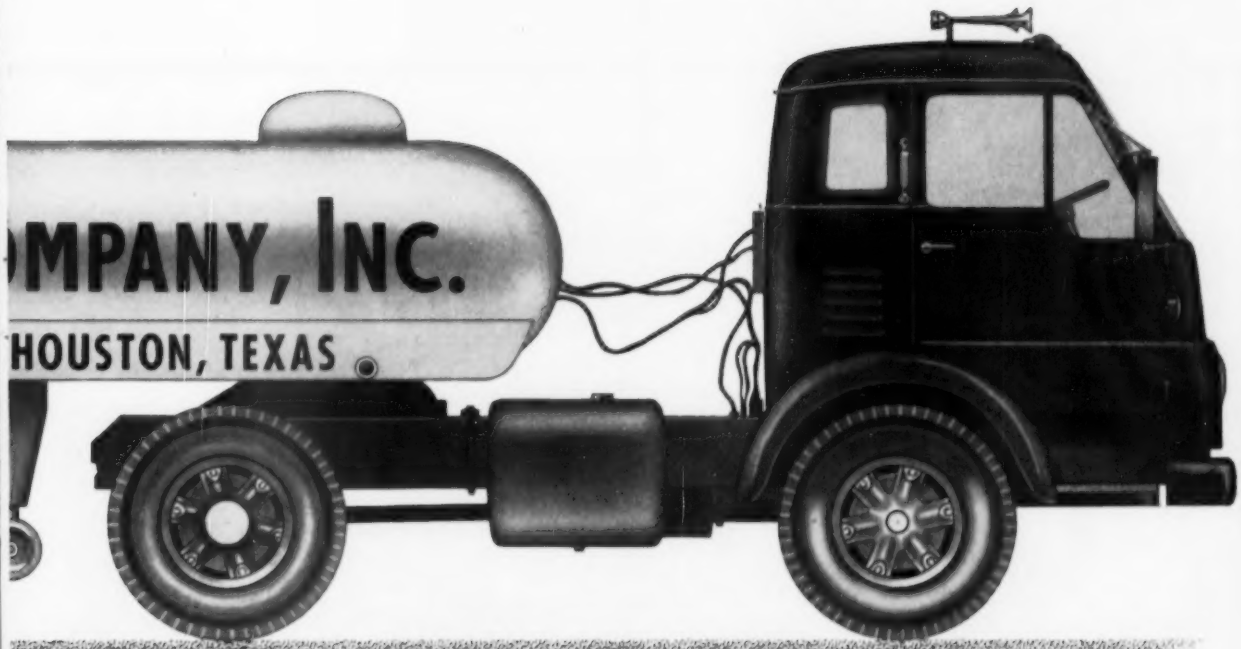
The overall average cost for a *land well*, with average depth of 4000 ft, is $50,200, but in different parts of the country wells with the same average depth varied in cost from about $40,000 to $85,000. The cost of a well goes up rapidly with increasing depth, as shown by the following averages: 3000 ft—$25,000; 6000 ft,—$75,000; 9000 ft — $125,000; 11,000 ft — $225,000; 14,000 ft — $350,000; 15,000 ft — $650,000.

Off-shore wells are much more expensive, averaging $299,800 for an average depth of 9500 ft, as compared to land wells, which averaged $175,000 for about the same depth.

Correction

In an article entitled "Petrochemicals," which appeared in the March issue under Technical Trends (p 19) we gave credit to *Petroleum Engineer* for publication of a "1955 Petrochemical Handbook." However, George B. Gibbs, editor of *Petroleum Refiner*, Houston, tells us that his magazine published the handbook in the December 1955 issue.

Supplying the odorant requirements for NATURAL GAS in the Chicago area . . .



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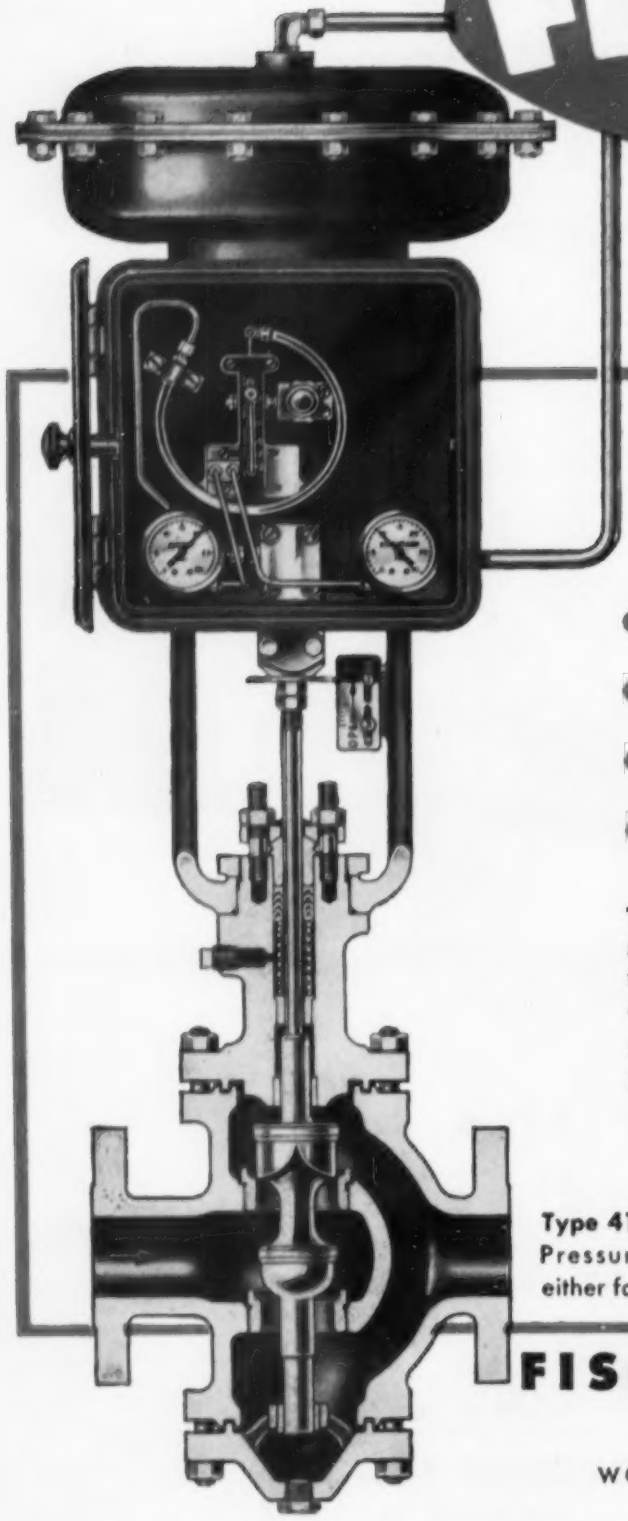

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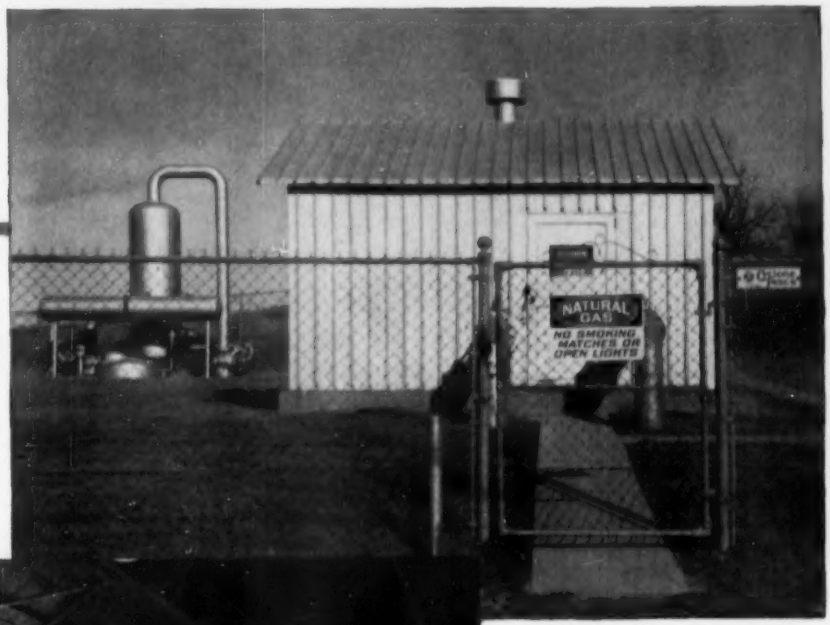
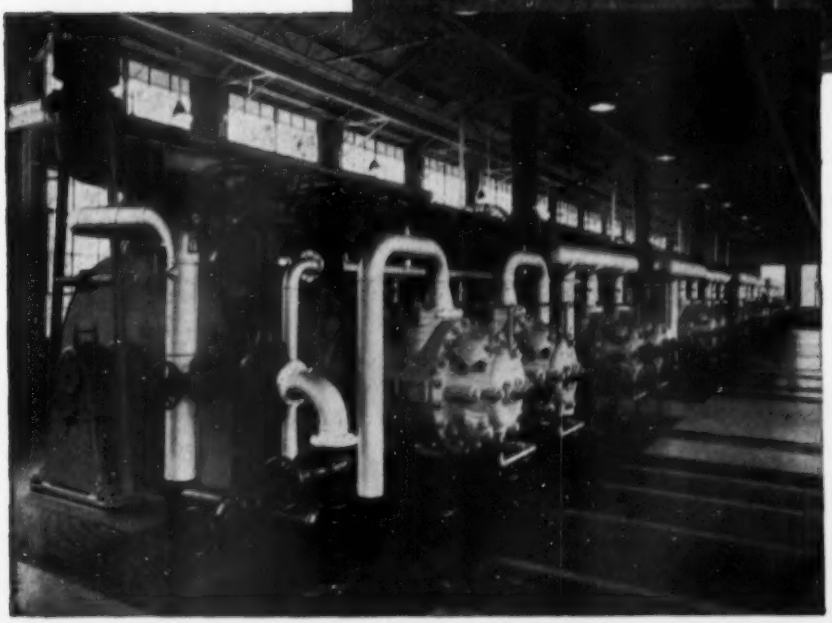


A TYPICAL MIDWESTERN CITY BORDER STATION



HIGH PRESSURE COMPRESSOR STATION ON A SOUTHWESTERN PIPELINE

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CANADIAN PLANT: WOODSTOCK, ONTARIO

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CONSTANT AIR PRESSURE INSURES A UNIFORM CUT WHEN DRILLING GAS MAINS UNDER PRESSURE: The above Mueller C1-36 Drilling Machine, powered by Jaeger "125" rotary compressor, is drilling a 10" main under pressure, preparatory to installing line stopper plug. The constant, unfluctuating air pressure maintained by the Jaeger rotary is of great importance for this work. It insures the uniformly accurate cut, by the drilling machine, which is needed for proper seating of the inserted plug. Job pictured is in North Carolina.

By far the most efficient compressor

There are two good reasons for the rapidly increasing use of Jaeger rotary air compressors for utility installation and maintenance work:

1: The Jaeger produces the same volume of air as other rotaries *at 100 to 150 rpm slower engine speed,* using less horsepower, less fuel and correspondingly less wear on engine and compressor. (Full load speed in a Jaeger "125" is only 1700 rpm, in a Jaeger "600", it is only 1650 rpm.)

2: In a Jaeger rotary the air delivery is instantaneous and so closely regulated that pressure holds *constant* under all normal work demands. Speed modulation is smooth and completely stepless over the entire operating range and over-run and racing of the engine are positively prevented. Air tools operate smoothly and at top efficiency at all times.

Jaeger controls are also very simple—no complex linkage, toggles or metering orifices.

THE JAEGER MACHINE COMPANY 661 Dublin Avenue, Columbus 16, Ohio • Canadian Plant, St. Thomas, Ont.

TRENCHING 3 FT. OF FROZEN GROUND is all in the day's work of making service connections in Minnesota winter weather. The Jaeger "125" rotary is operating a Thor 18 clay spade. It has capacity to operate two of them.

3 MILES TO GO IN TACOMA: Steady full pressure in two #25 Thor breakers means fast, steady progress on this job, cutting 3 miles of trench in Tacoma, Wash. The Jaeger rotary, with retractable pneumatic tired dolly wheel (standard) is easily moved along by hand.

for street work

Efficient multi-pass oil cooling produces air that averages 100° cooler temperature. Automatic by-pass eliminates danger of "dry starts" in cold weather. Jaeger fuel tanks hold 8 hours' supply. Tool boxes, on smaller models, hold a full set of tools.

Built in 125 to 600 cfm sizes. For complete data or demonstration, ask your local Jaeger distributor or write us for Catalog JCR5.

Pumps • Concrete Mixers
Truck Mixers • Paving Machines • Loaders

50th Year JAEGER

FULL DRILLING SPEED AT ONLY 1400 RPM compressor speed: Jaeger "125" Roto is ideal for operating the 5 hp. Ka-Mo earth drill. Jaeger "250" and "365" rotaries are equally efficient for larger (10 and 15 hp) Ka-Mo units. Above job was at Columbus, Ohio. Same "125" compressor averaged only 1½ gallons per hour of fuel, running two 80-lb. breakers on job of cutting 1200 sq. ft. per day of brick and asphalt pavement for this trench.

COMPLETING 7 MILES OF TRENCH in Washington, D. C.: Roto Air Plus® "125" operates triplex tamper on this job of laying 35,000′ of 24″ transmission line. The contractor has since bought two more Jaegers.

10 ON THIRD AVENUE: This Jaeger "125" is one of 10 Jaeger rotaries being used for underground utility work along New York's Third Avenue, following removal of the famous Third Avenue "El".

There's no customer

Ewing Galloway

This is Baltimore—a thriving city of nearly a million population.

Bettmann Archive

This is a view of Baltimore, from Federal Hill, as it looked about 100 years ago.

MODERNIZED cast iron

like an old customer!

BALTIMORE'S Consolidated Gas Electric Light and Power Company bought cast iron pipe 100 years ago . . . and buys it today.

The first gas franchise in America was granted to The Gas Light Company of Baltimore, predecessor of the Consolidated Gas Electric Light and Power Company of Baltimore. Today, this progressive Company is serving 329,617 customers with approximately 2100 miles of mains, the majority of which are cast iron. A section of one of these mains, laid prior to 1830, is shown below (see cut).

When you have customers with an unbroken record of buying your product for over a century, you naturally prize them. They're scarce in any long-established business or industry. The cast iron pressure pipe industry is proud to have 70 such customers—utilities that have been buying cast iron pipe for gas or water mains for 100 years or more.

Today's *modernized* cast iron pipe—centrifugally cast and with standardized mechanical joints—is even more economical and efficient. The pipe is stronger, tougher, more uniform in quality. The mechanical joints are bottle-tight for usual gas pressures and for all types of gas.

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Ill.

This 10-inch cast iron gas main was laid in Baltimore over 120 years ago and is still serving. It is America's oldest functioning gas main.

CAST Q IRON ®

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.

pipe FOR MODERN GAS DISTRIBUTION

ONE OF THE DRESSER INDUSTRIES

CLARK

CLARK BROS. CO., Olean, New York—Gas turbines, engines, and reciprocating, centrifugal and axial flow compressors — gas, steam, electric and diesel driven.

DRESSER IDECO

DRESSER-IDECO DIVISION, Columbus, Ohio — Radio and television broadcasting towers, steel buildings, aircraft hangars, mechanical parking garages, electric power substations.

DRESSER MANUFACTURING DIVISION

DRESSER MANUFACTURING DIVISION, Bradford, Pa. — Pipe line couplings, pipe repair sleeves and clamps, weldments, forgings, welding fittings, flanges, rings.

IDECO

IDECO, Dallas, Tex.—Hydrair and Power Rigs; Full-View Masts; Substructures; Single, Dual and Drive-In Rambler Rigs; Blocks, Swivels, Rotaries; Mud Pumps; Petroleum Equipment and Supplies.

Magcobar.

MAGNET COVE BARIUM CORP., Houston, Tex.—Magcobar and Magcogel drilling muds and other specialized oil well drilling fluids and chemicals.

PACIFIC

PACIFIC PUMPS, INC., Huntington Park, Calif — Centrifugal pumps for refineries, power stations, pipelines, and chemical plants; plunger pumps for oilwells.

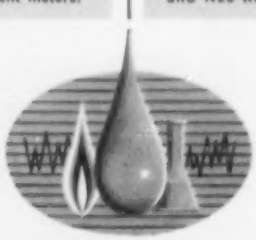
ROOTS-CONNERSVILLE

ROOTS-CONNERSVILLE BLOWER DIVISION, Connersville, Ind.—Rotary positive blowers, gas pumps, centrifugal blowers, exhausters, and positive displacement meters.

Security

SECURITY ENGINEERING DIVISION, Dallas, Tex., Whittier, Calif. — Rock bits, reamer rock bits and hole openers; reamers, casing scrapers and Neo-Red rubber stabilizers.

Tomorrow's progress planned today



Look for this symbol

...it identifies all Dresser Companies and their products... it is your guarantee of the DRESSER *plus+*

You gain an important extra plus value every time you are served by any of the Dresser companies. This is the unique way Dresser operates to serve you better. Each Dresser company works independently to assure maximum individual attention to your specific needs . . . yet all are teamed together in a single organization to provide a group of research, engineering, and manufacturing services. From Dresser you obtain equipment based on the over-all experience of many companies in many industries.

As performance demands on equipment become increasingly greater, Dresser will continue to pace the technological changes in your field. You can count on the Dresser companies as major suppliers of equipment researched and developed to serve you better and meet your future needs.

Wherever you are, whatever your needs, specify equipment from Dresser companies. No other single organization offers you the same broad range of "know-how" coupled with individual company attention to these specific needs. Be sure to look for this symbol — it's your guarantee of the Dresser *Plus+* . . . the mark of superior equipment and services which have become the standard of comparison the world over.

LANE WELLS COMPANY

LANE-WELLS CO., Los Angeles, Calif., Houston, Tex., Oklahoma City, Okla.—Electric and Radioactivity Well Logging, Koneshot perforating and bullet perforating, packers and bridging plugs.

SIE

SOUTHWESTERN INDUSTRIAL ELECTRONICS, Houston, Tex.—Seismograph systems and instruments—electronic, electro-mechanical. Computers—analog and digital; recording systems. Special transformers, reactors.

REPUBLIC NATIONAL BANK BUILDING • POST OFFICE BOX 718 • DALLAS 21, TEXAS

ROCKWELL-

Often Copied...

40th YEAR *of*

Nordstrom VALVES

Never Equaled

Rockwell-Nordstrom is the *original* lubricated plug valve. But that is only part of the story behind forty years of lubricated plug valve leadership. Starting with the first valve, *every major development* in lubricated plug valves has come to you *first* in a Rockwell-Nordstrom valve. Today, as always, the *oldest* lubricated plug valve is also the *newest* in terms of better performance, longer life and lower cost.

Below are listed only a few of the more than ninety basic Rockwell-Nordstrom valve and lubricant innovations. They are the reasons why Rockwell-Nordstrom valves—although often copied—have *never* been equaled. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers Limited

ROCKWELL-Nordstrom VALVES

Lubricant Sealed for Positive Shut-off

first... for forty years *Here are just a few of more than ninety basic valve and lubricant innovations that have maintained the leadership of Rockwell-Nordstrom valves—through better performance, longer life and lower cost.*

- **FIRST Lubricated Plug Valve**
- **FIRST Sealdport* pressurized lubricant sealing**
- **FIRST Hydraulic plug jacking for fast, dependable operation**
- **FIRST Hypreseal* for high pressure plug valve service (still exclusive)**
- **FIRST Special plug and body coatings—longer life on "tough" services**
- **FIRST Automatic shut-off valves for gas pipelines**
- **FIRST "Self-Energizing" valve lubricants**
- **FIRST Line of special and general purpose valve lubricants**
- **FIRST Multiport lubricated plug valves for 3-way and 4-way flow control**
- **FIRST Lubricated plug valve for low temperature service**
- **FIRST Venturi valve for lower cost on larger lines**
- **FIRST Lubricated plug Christmas tree valves**

*Registered trade mark Rockwell Manufacturing Company

lubricated plug valve leadership

Help Wanted

FOR A VITALLY IMPORTANT

Twelve forward-looking manufacturers of equipment used by the gas industry are investing their money to help increase the sale of gas and of gas-burning appliances and equipment. These manufacturers know that as the gas industry goes, so goes their business.

The job that needs doing is too big for twelve manufacturers. Every supplier to the industry is invited to share in this business insurance program, under the direction of the Equipment Manufacturers' Advisory Committee of GAMA.

HOW YOU CAN BENEFIT

Mr. Supplier. Help insure your future earnings by investing in this program.

Mr. Utility. Make this program pay extra dividends for you by mailing proofs of these ads to your dealers and running these ads in your newspapers over your company name. FREE reprints and mats are available.

Published as a Service to the Gas Industry by

AMERICAN METER CO.

AMERICAN®
METER COMPANY
INCORPORATED ESTABLISHED 1833

JOB THAT NEEDS DOING

Gas GIVES YOU MORE FREE TIME
7 ways Gas makes your home modern as tomorrow
Gas
GAS is 7 ways better for the 7 big household services

National advertisements like these, designed to increase the sale of gas, are paid for by the following Suppliers to the Gas Industry.

A. C. Lawrence Leather Co.
American Cast Iron Pipe Co.
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Fisher Governor Co.
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U. S. Pipe & Foundry Co.
Mueller Company
Rockwell Manufacturing Co.
M. B. Skinner Co.
Sprague Meter Co.
Superior Meter Co.
Subsidiary of Neptune Meter Co.

MEN WITH VERY LITTLE TRAINING

MAKE JOINTS QUICKLY,

CUT TENITE WITH HAND SAWS

Tubing of Tenite is easy to install

Tubing made of Tenite Butyrate plastic is just about the easiest-to-install piping material made. When putting in a service line, you merely uncoil the length you need, and cut it with an ordinary hand saw. If you want to join two lengths, a slip-sleeve coupling, solvent cement and a paint brush do the job quickly. Tees and other fittings are connected the same way. And when the tubing is to be joined to metal pipe, simple adaptors make the job go fast.

When replacing corroded metal service lines, the tubing can be run right through the old pipe. You dig holes only at the main tap and the service riser--trenching is eliminated.

These aren't the only advantages of tubing made of Tenite Butyrate plastic. It resists corrosive soils and electrolytic attack, almost eliminating maintenance. And since even the joints need no protection against corrosion, hot asphalt and its hazards are eliminated.

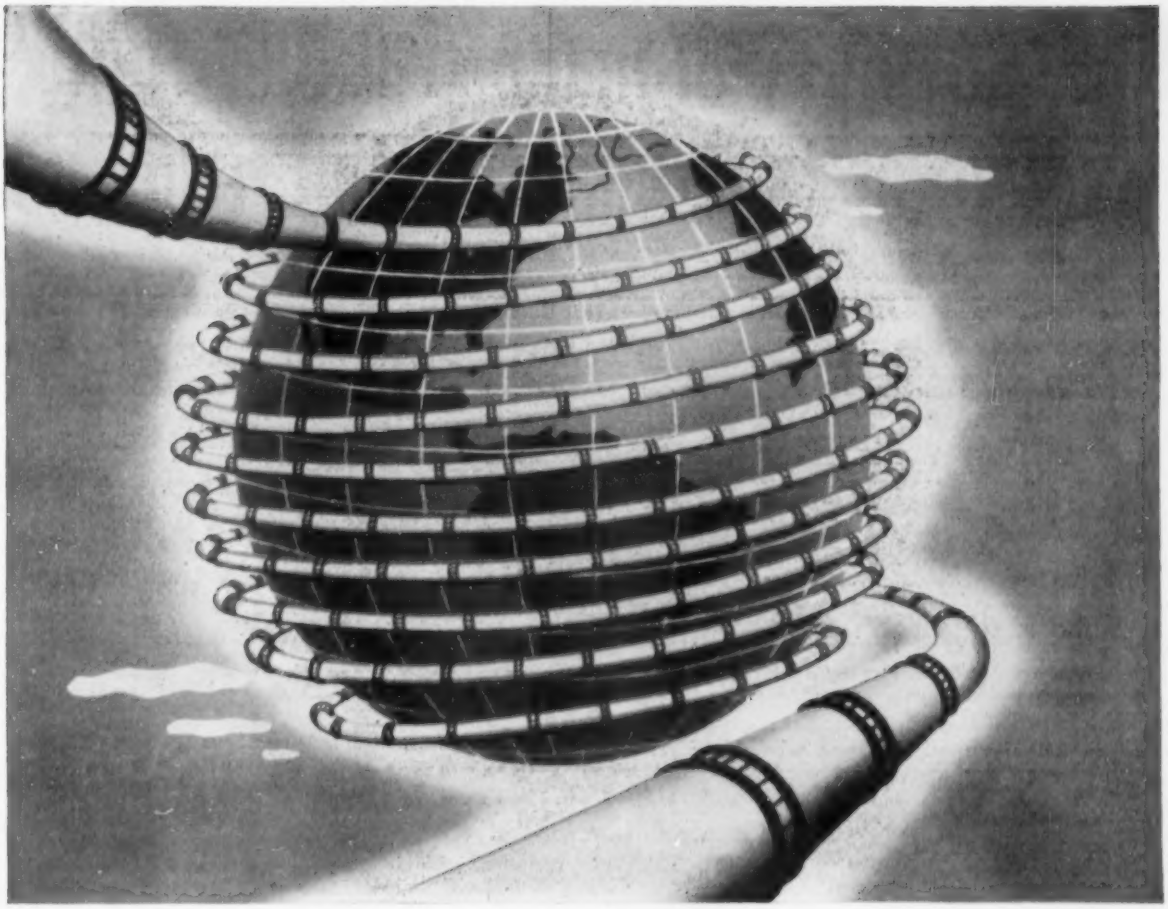
Tubing of Tenite has been saving money for utilities since 1943. Find out how you can share in these benefits. At your request, we'll send you the names of distributors in your area who handle tubing of Tenite Butyrate, plus information describing the tubing, its fittings, and installation methods in gas service applications. Write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "PLASTIC PIPELINES," is available upon request.

TENITE

BUTYRATE

an Eastman plastic



HALF A MILLION MILES FROM MALTA

Back in the 1830's, the by-product of oil—natural gas—was usually flared at the wells. The leaky, threaded-joint pipe lines of that day made it impossible to transport gas under pressure.

This waste so disturbed Solomon R. Dresser, a Bradford, Pa., oilfield manufacturer, that he set out to perfect a truly gastight pipe joint.

Having pioneered in the use of rubber to cap oilwells, he developed an amazingly tough rubber compound. Around this he built his coupling, designed so that when the bolts were tightened, the rubber gasket compressed and formed an absolutely gastight seal.

To prove its worth, he bought a gas well and built a 5-inch, 4-mile pipe line to Malta, Ohio . . . and later to McConnelsville across the Muskingum River. Recently, parts of the Malta line were inspected by Dresser engineers. The rubber gaskets compressed in the couplings were still lively, the couplings still gastight.

Since Malta, more than half a million miles of pipe have been protected with leakproof Dresser Couplings. If this were a continuous pipe line, it would stretch, gastight, 20 times around the world.

DRESSER® ONE OF THE DRESSER INDUSTRIES **FITTING PARTNER FOR THE GAS INDUSTRY**

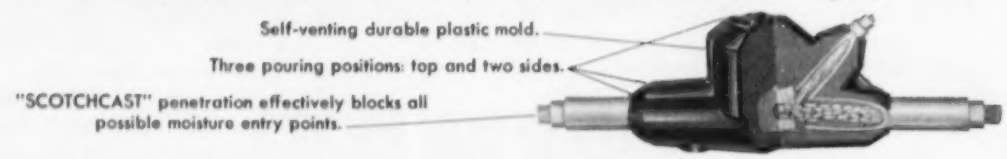
Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales Offices also in: New York, Philadelphia, Chicago, Atlanta, Denver. In Canada: Toronto, Calgary.

Now anyone can make "Factory Tight" wye or tap splices in the field!

New "SCOTCHCAST" Splicing Kit gives maximum protection against moisture and electrial breakdown . . . solves splicing problems in rectifier ground bed installation

ALL MATERIAL for this revolutionary non-technical method of making wye or tap splice is included in new "SCOTCHCAST" Kit No. 90B1.

This cut-away view shows Factory-Tight "SCOTCHCAST" splice


Self-venting durable plastic mold.
Three pouring positions: top and two sides.
"SCOTCHCAST" penetration effectively blocks all possible moisture entry points.

"SCOTCHCAST" RESIN SPLICE KIT No. 90B1: for use in cathodic protection ground bed splicing, street lighting systems, traffic signal systems, or any place where the very best protection against electrical breakdown or moisture is a must. It offers the following advantages:

1. Complete moisture protection in weather-exposed locations, direct burial, including underwater use.
2. Thorough protection from mechanical and electrical stresses; uniform protection from splice to splice.
3. Ease and speed of application: an average field splice can be made in 10 minutes . . . even under adverse conditions.

REG. U.S. PAT. OFF.
SCOTCHCAST
BRAND

For further information write on your letterhead to 3M Co., St. Paul 6, Minn., Dept. DT-56.

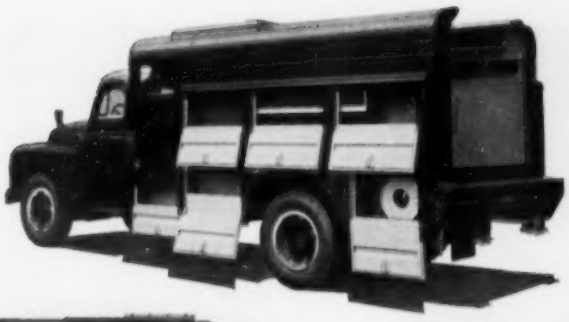
3M COMPANY

The term "SCOTCHCAST" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

Standardized..

Standardization of truck bodies and equipment is increasing in importance. Operating companies have found that standardized bodies improve efficiency. They enable crews to work from different vehicles with no difficulty in locating tools or supplies. They reduce operating costs by stepping up productive manhours. They provide fleet similarity... and are most economical from the standpoint of initial investment and maintenance costs.

In the Powers-American line you'll find standardized gas service, maintenance, and construction bodies... built to specifications that are based on known requirements. Modifications can be made, if necessary, to fit your needs. Production in quantity reduces cost and delivery delay. Why not investigate the merit of these bodies for your job?



STANDARD SERIES 850C GAS LINE CONSTRUCTION and MAINTENANCE BODY, with built-in air compressor and air hose reels.

Custom-Made

The widely varied operations necessary in transmission and distribution of gas, makes complete body standardization impractical. In supplying custom-made bodies and equipment to operating companies throughout the country, Powers-American engineers have developed production methods that greatly reduce costs. If your work requirements call for equipment that is tailor-made in every respect... or if you can use bodies which are modified from standard designs... Powers-American can supply the unit you need, at a cost that is reasonable. Should you require complete plans or assistance in the development of special equipment, Powers-American engineers are at your service.

CUSTOM-MADE GAS LINE CONSTRUCTION BODY

POWERS American GAS BODIES

Want more information on Powers-American standardized bodies? Just drop us a line and tell us the type of body you need. For details on custom-made bodies, please send us a description of the equipment you require, plus sketches which may be helpful in supplying the data you desire.

CUSTOM-MADE GAS SERVICE BODY

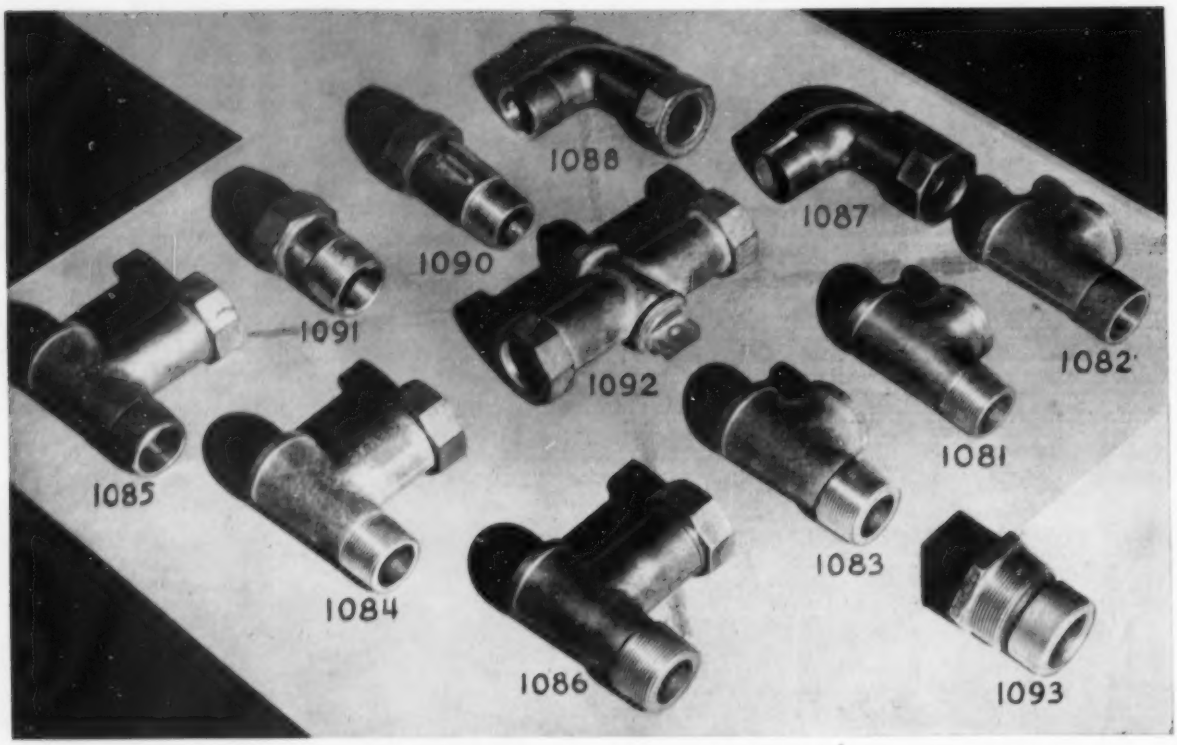
STANDARD SERIES 44 SERVICE BODY

McCABE-POWERS AUTO BODY CO.

5900 NO. BROADWAY, ST. LOUIS 15, MO.

625 CEDAR STREET, BERKELEY 10, CALIF.

"The Accepted Standard with Utilities Everywhere"



NORMAC Red Brass Fittings for use with Copper or Plastic Tubing . . .

IN ½", ¾", 1", and 1¼" COPPER SIZES

Above are shown different types of brass fittings for use with copper or plastic tubing. These fittings are a development over the years and can be used either on new installations or where tubing is run through old steel pipe for installation in small street openings. The NORMAC line of brass fittings is unique in that the center-to-end dimensions of all fittings correspond with the dimensions of fittings which must be removed from the main. This feature is extremely important in the use of these fittings in small opening work where the smaller tubing must line up with the steel which has been removed.

1081 — Service "Tee"
1082 — Service "Tee" for Solder Connection
1083 — Reducing Service "Tee"
1084 — Compression-End Service "Tee"
1085 — Compression-End Service "Tee" for Solder Connection
1086 — Reducing Compression-End Service "Tee"
1087 — Compression-End Service "Ell"
1088 — Compression-End Service "Ell" for Solder Connection
1090 — Male Adapter
1091 — Reducing Male Adapter
1092 — Compression-End Stop Cock
1093 — **Malleable Service Head Adapter**

• **NORMAC Malleable House T Manufactured in 1¼-inch Size Only**

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

COUPLINGS • METER BARS • SLEEVES • COCKS • BELL JOINT CLAMPS • SERVICE TEES and ELLS

Crew unloading gas pipe from full-length tunnel in 7102C. Three vertical and one horizontal compartment with optional inserts are contained on the right side.

Comfortable 4-man crew compartment contains sliding windows with air scoops, spring seat and folding shelf. Bodies can be furnished with compartments made to order.

PIPE "DREAM" MADE TO ORDER...

... just the way you want it, depending upon the amount and type of gas line construction work you handle. This "dream" body, Series 7000, is a new idea in utility body design. You specify what you need in the way of compartments, adjustable bins, drawers and separators and Holan engineers will modify the design to your specifications. In other words, you get a "custom" body at less cost!

Basic sizes in the 7000 series accommodate chassis from 60" to 102" C.A. dimension. Crew compartments and roof enclosures are optional. Every size body is equipped with a full-length front-to-rear pipe tunnel. You even have the option of buying compartment inserts knocked-down for assembly in your fleet garage.

This is truly the opportunity gas companies have been waiting for—the chance to buy quality at limited-budget prices.

You can *now* buy Holan, the name that *means* work simplification, at a price that fits your purse.

Write for catalogs and price information on Holan 7000 and 7000C Bodies.

Air compressor bodies with hose reels in rear compartments.

Air compressor bodies with left handed compartments and air winch for backfilling.

Air compressor bodies with pipe compartment and provisions for oxygen and acetylene tanks.

Air compressor with skid-mounting and independent gasoline engine.

General service bodies with special gas meter compartments.

Service bodies for chassis up to 1½ tons. Lengths 72", 75", 84", 90" and 102". Optional compartment arrangements.

J.H. HOLAN CORPORATION

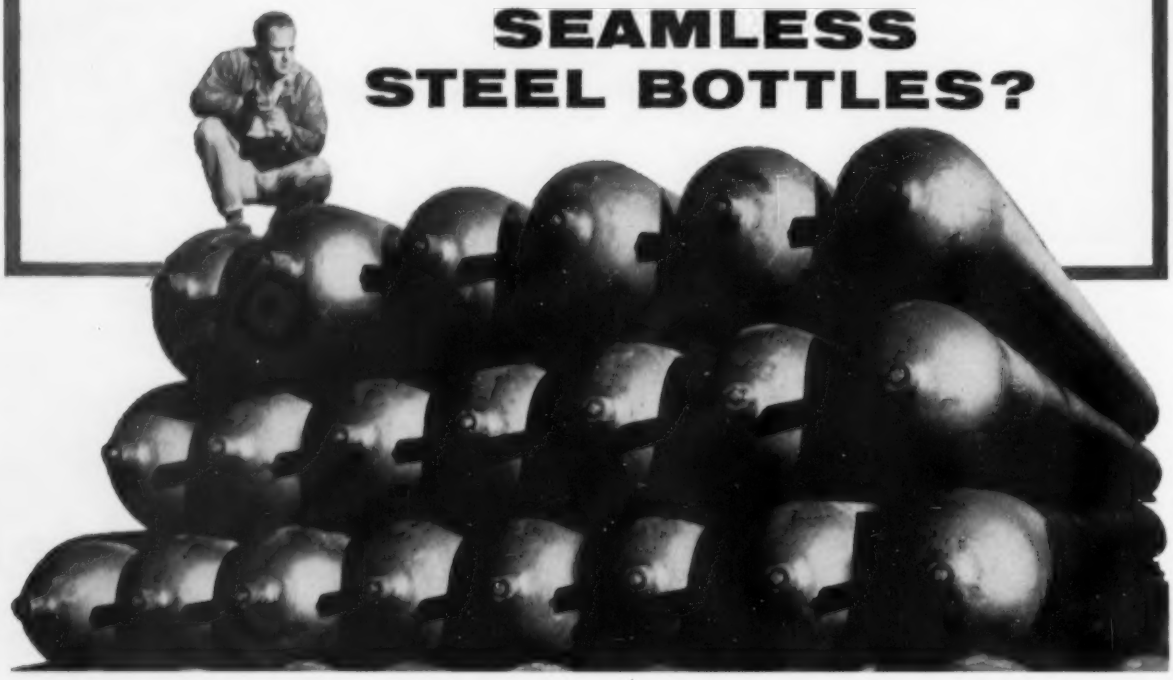
4100 WEST 150TH STREET
CLEVELAND 11, OHIO

OTHER PLANTS:
HOLAN CORPORATION OF GEORGIA, Griffin, Ga. • J. H. HOLAN CORP., Phoenix Div., Arizona
BRANTFORD-HOLAN LIMITED, Brantford, Ontario

THE NAME THAT MEANS WORK SIMPLIFICATION

What's so good about underground gas storage in

SEAMLESS STEEL BOTTLES?



A FAIR QUESTION — AND AN EASY ONE TO ANSWER.

UNDERGROUND GAS STORAGE IS PRACTICAL

Fifty of these Seamless Steel Bottles, each averaging 39 feet in length and 24 inches in diameter, will hold 1¼ *million* cubic feet at 2240 psi. Once installed in the ground, the bottles will not vibrate and settle like a surface installation will. And because underground temperatures are relatively stable the year round, there is little or no fluctuation in gas pressure.

UNDERGROUND GAS STORAGE IS ECONOMICAL

Seamless Steel Bottles call for virtually no maintenance. Unlike aboveground installations, these bottles do not require periodical painting, nor do they need constant inspection against the elements. Moreover, any group of bottles can be taken off the line for inspection or repair at any time without interrupting the gas pressure of the other groups of bottles.

UNDERGROUND GAS STORAGE IS SAFE

Buried underground, National Seamless Steel Bottles are safe from harm. They are effectively protected from storms, high winds and lightning. And there is no hazard to or from aviation.

NATIONAL SEAMLESS STEEL BOTTLES ARE DEPENDABLE

The process of manufacturing National Seamless Steel Bottles assures the utmost in safety, performance and long-time, dependable service. The bottles are pierced from solid billets of high quality steel, leaving little room for doubt where wall strength is concerned. And before being shipped, every bottle is subjected to a high pressure hydrostatic test at the mill.

For more complete details about this modern, economical system of gas storage, write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

National Seamless Steel Bottles

WELDS WITHOUT WELDS

UNITED STATES STEEL

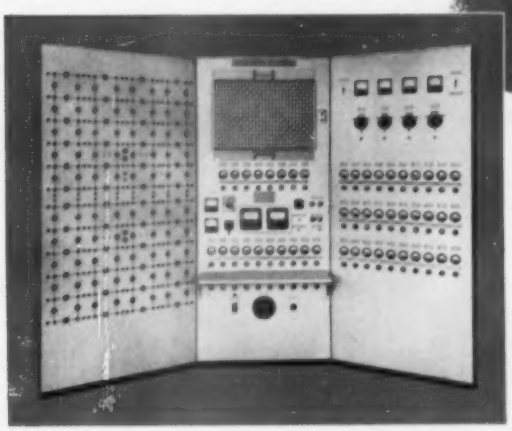
"LOOK WHAT HAPPENED"

to our plans when tested on the

McILROY FLUID NETWORK ANALYZER

Important Hidden Weakness Quickly Revealed

Alternate Plans Quickly Devised and Successful Solution Developed in only 18 hours.



Are you doing distribution engineering of this high calibre? If not, you should know more about . . .

THE McILROY FLUID NETWORK ANALYZER

Write for engineering data

THE TEST SHOWED:

that this section of proposed 12-inch main would not improve pressures as anticipated. Would have wasted thousands of dollars.

that a proposed source would improve conditions over too small an area.

that in three years new load growth would cancel out the slight benefits of our proposed plan.

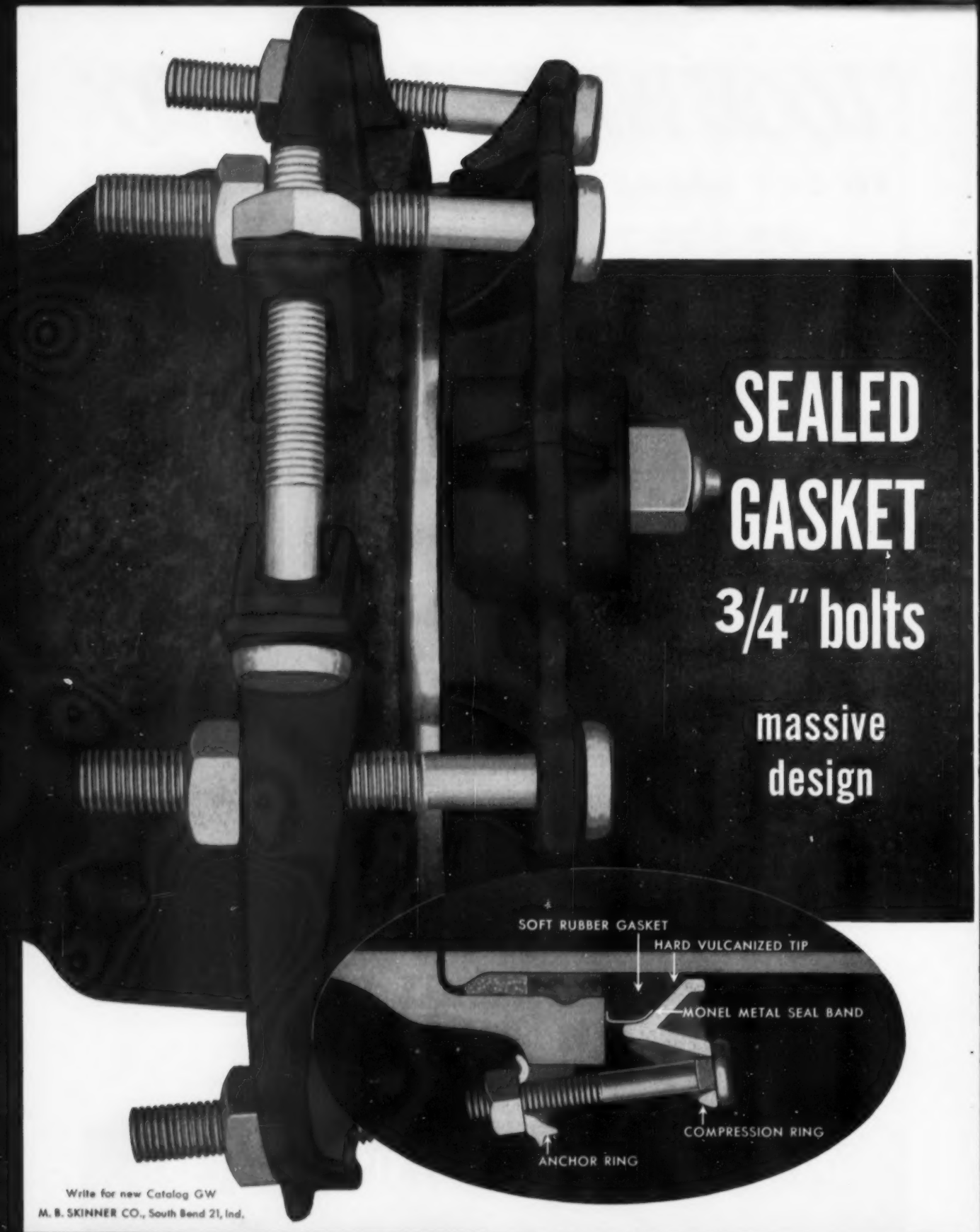
THIS WAS THE BIG PAY OFF

After testing 15 alternate, suggested plans, a final plan was selected which provided a proper margin of safety for predictable load growth, and assured maximum benefit for every dollar invested. This testing of alternate plans and development of the final, efficient, economical plan occupied only 18 hours on the McIlroy Analyzer.

Since STANDARD 1884

The STANDARD ELECTRIC TIME COMPANY

125 Logan Street · Springfield 2, Massachusetts



Write for new Catalog GW
M. B. SKINNER CO., South Bend 21, Ind.

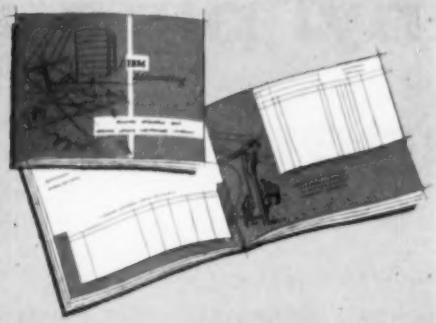
SKINNER-SEAL BELL JOINT CLAMP

A COST-FREE WAY TO DISCOVER

40 WAYS Public Utilities can get added profits from IBM Accounting

3 NEW GUIDES... FROM IBM

1. Customer Accounting. This 24-page booklet outlines the Customer Accounting procedure from initial application for service to accounts receivable statements.



2. General Accounting. This 44-page booklet is a guide to the IBM punched card documents and the machine reports you can get in such fields as: Property Accounting, Construction Accounting, Payroll (including check preparation and payroll tax reports), Operating Ledgers, and Electronic Data Processing.

3. Electronic Data Processing. This 16-page booklet describes the application of the IBM 650 to Customer Accounting operations, including an IBM 650 schematic program for Bill Calculation and Statistics.

Here are 40 opportunities for improving Public Utility accounting through IBM data processing. Several of these applications are actually by-products of other jobs. Many of them can be accomplished on present equipment . . . in *addition* to your current applications.

Now is the time to determine whether *your* machine accounting system is adequate for the increasing demands on your company. For today, new machines and improved applications hold the answer to a broader and even *more* profitable use of IBM methods.

The three folders offered here tell the complete story. With them you can decide for yourself *exactly* how and where you can start cutting costs . . . and giving even better customer service.

Send for your copies today—without obligation, of course.

Check list of 40 IBM data processing applications for electric, gas and water utilities

Use this list for a quick review of current applications. If you want to get even more from present equipment, or need further information on a *particular* application, just check off your area of interest . . . and send this list in with your coupon.

___Customer Billing
___Revenue Accounting
___Sales Analyses
___Rate Studies
___Government Tax Reports
___Merchandise Billing
___Merchandise Accounting
___Customer Accounts Receivable
___Accounts Receivable Control
___Collection Records
___Security Deposit Records
___Market Surveys
___Meter Control Records
___Meter Test Records
___Payroll Accounting
___Pay Checks and Earnings Records
___Pension Records
___Wage Studies
___Personnel Statistics
___Accident Records
___Savings and Loan Accounting
___Stores Accounting
___Physical Inventory
___Purchase Analyses
___Fuel Records
___Transportation Accounting
___Accounts Payable Accounting
___Expense Distribution
___Budget Reports
___Operating Reports
___Financial Reports
___Functional or Responsibility Accounting
___Insurance Records
___Engineering Studies
___Construction and Retirement Accounting
___Continuing Property Records
___Operating Ledgers
___General Ledgers
___Stockholders Records
___Dividend Checks and Proxies

IBM DATA PROCESSING

- DATA PROCESSING
- ELECTRIC TYPEWRITERS
- TIME EQUIPMENT
- MILITARY PRODUCTS

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Please send my FREE copy of:

☐ IBM Customer Accounting ☐ IBM General Accounting
☐ IBM 650 Electronic Data Processing

Name_____

Company_____

Street_____

City_____ Zone_____ State_____

News about

B.F.Goodrich Chemical *raw materials*

Easy-to-install Geon rigid vinyl pipe lasts longer

THE exceptional physical and chemical properties of pipe and fittings made from Geon rigid vinyl resins have cut costs in many systems and made entirely new applications possible. Here are the reasons:

1. **Resists oil, acids, alkalis, most chemicals.**
2. **Has high tensile and impact strength.**
3. **Resists sunlight, fungi, bacteria, moisture, heat and cold.**
4. **Smooth internal surface reduces flow resistance.**
5. **Rigid enough for overhead installation with pipe supports, but flexible enough to absorb shocks.**
6. **Easy to install. Lightweight (see photo), fittings attached by solvent cementing, threading, heat welding or adhesives.**
7. **Being a non-conductor, does not support electrolytic action.**

Applications include sour crude oil lines, salt water lines, chemical plant piping, industrial cold water lines, vent pipes for acid fumes and corrosive gases. Vinegar plants, ships at sea, oil fields —all are enjoying the rewards of cheaper and easier installation, lower material cost and longer pipe life under extreme conditions. For ideas on how pipe made from Geon can help you, write Dept. DM-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Accuracy

THAT BEHAVES AS IT SHOULD

Tomorrow's profits rest in the hands of the gas meters you buy today. That's the "credo" of Superior design and manufacture . . . to profit for you in three ways:

First . . . through unfailing accuracy, to protect public confidence in your services . . . at the same time protecting those services by preventing losses in the revenue needed to maintain them.

Second . . . to reduce repair costs. Superior concentrates on the little details that keep vital parts working years longer without replacement . . . details that save valuable minutes in the shop . . . details that help you get Superior meters OK'd and back on the job without fuss or delay.

And third . . . to protect you from premature obsolescence . . . by building meters that last longer . . . and by a firm policy of always making repair parts available for Superior meters . . . no matter how old.

What more could you ask of a quality meter? Ask it all of Superior . . . with confidence . . . next time you buy.

Send for Bulletin No. 1100

superior
GAS METERS

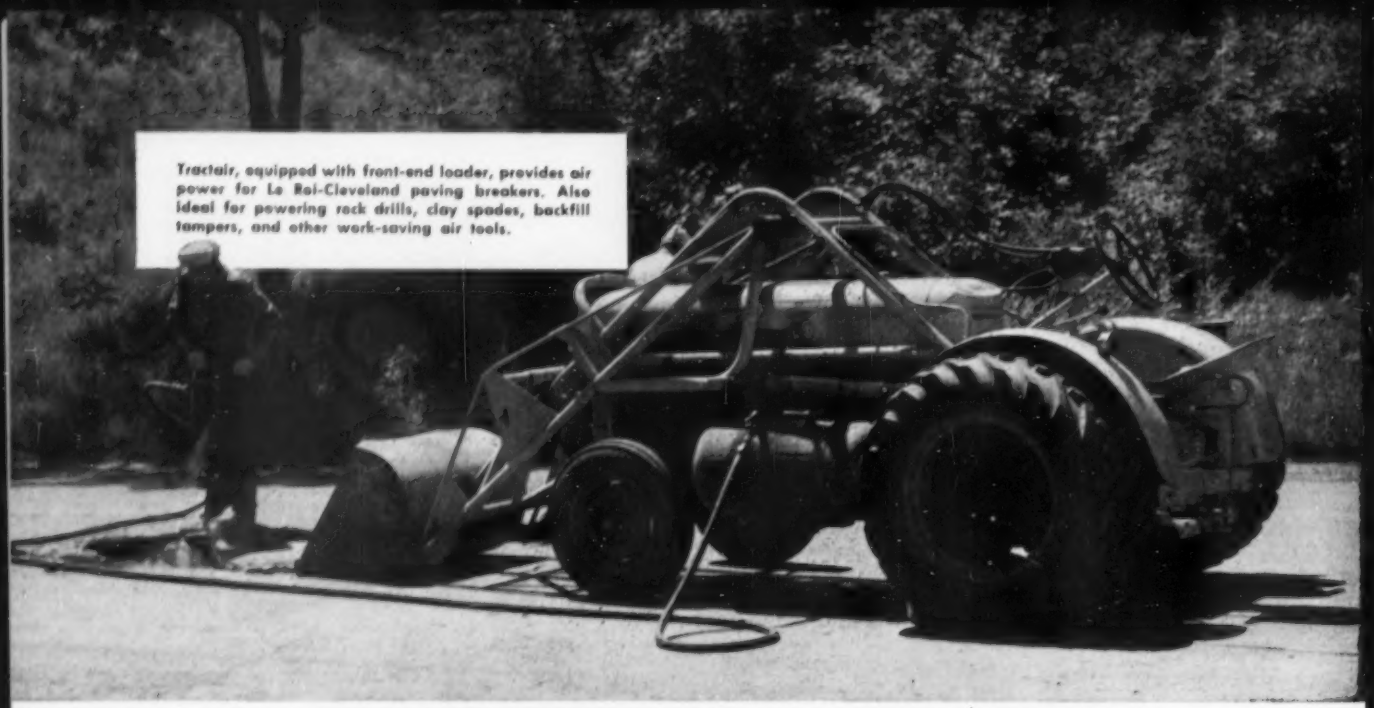
SUPERIOR METER COMPANY, INC.

19 West 50th St., New York 20, N. Y.

A SUBSIDIARY OF NEPTUNE METER COMPANY

SALES OFFICES: Atlanta, Boston, Chicago, Dallas, Denver, Los Angeles, Louisville, No. Kansas City, Philadelphia, Portland, Ore., San Francisco (Millbrae)

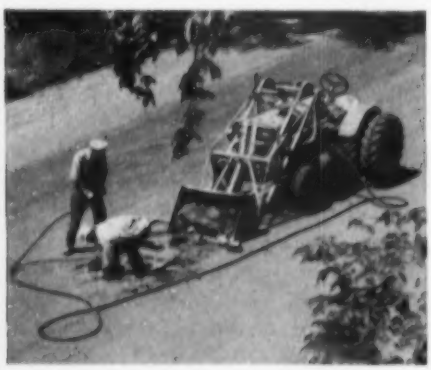
SU-3



Tractair, equipped with front-end loader, provides air power for Le Roi-Cleveland paving breakers. Also ideal for powering rock drills, clay spades, backfill tampers, and other work-saving air tools.

Combination Tractor-Compressor Unit Works 8-hour Day, All Year Long

One Le Roi Tractair (combination tractor-compressor unit) can do the work of several specialized machines — plus supplying 125-cfm air power for a wide variety of air tools. Because Tractair is a combination 42-hp wheel tractor and a dependable air compressor, here's what can happen on your jobs — in one day — using just one of the many Tractair attachments available:



Broken concrete is loaded out by the Tractair with front-end loader attachment.

Backfill blade easily replaces Tractair front-end loader bucket for light-grading work.

7:00 A. M. Tractair, equipped with a front-end loader, arrives at the job site. Le Roi-Cleveland pavement breaker powered by the Tractair's 125-cfm air compressor breaks concrete.

7:56 A. M. With the front-end loader attachment, the Tractair loads out broken concrete from the trench site.

8:39 A. M. Le Roi-Cleveland clay spades, powered by the Tractair compressor, trim up the excavation for pipe laying.

9:58 A. M. The operator drives the Tractair to another job to provide power for pumping out a water-filled trench.

11:00 A. M. Returning to the first job, the Tractair fills in the trench with its front-end loader.

11:30 A. M. The Tractair compressor provides air power for Le Roi-Cleveland tampers to compact the trench fill.

1:00 P. M. Using the front-end loader attachment, the Tractair loads out excess dirt into a truck.

1:20 P. M. The self-propelled Tractair proceeds to another job site and provides air power for rock drilling.

2:42 P. M. After rock has been blasted out, the Tractair 125-cfm air compressor provides air power for Le Roi-Cleveland breakers to trim up the hole.

4:05 P. M. With the crane boom on the front-end loader, the Tractair lifts and lowers heavy pipe into the trench.

4:45 P. M. The Tractair loads out debris to leave the work area clean and safe.

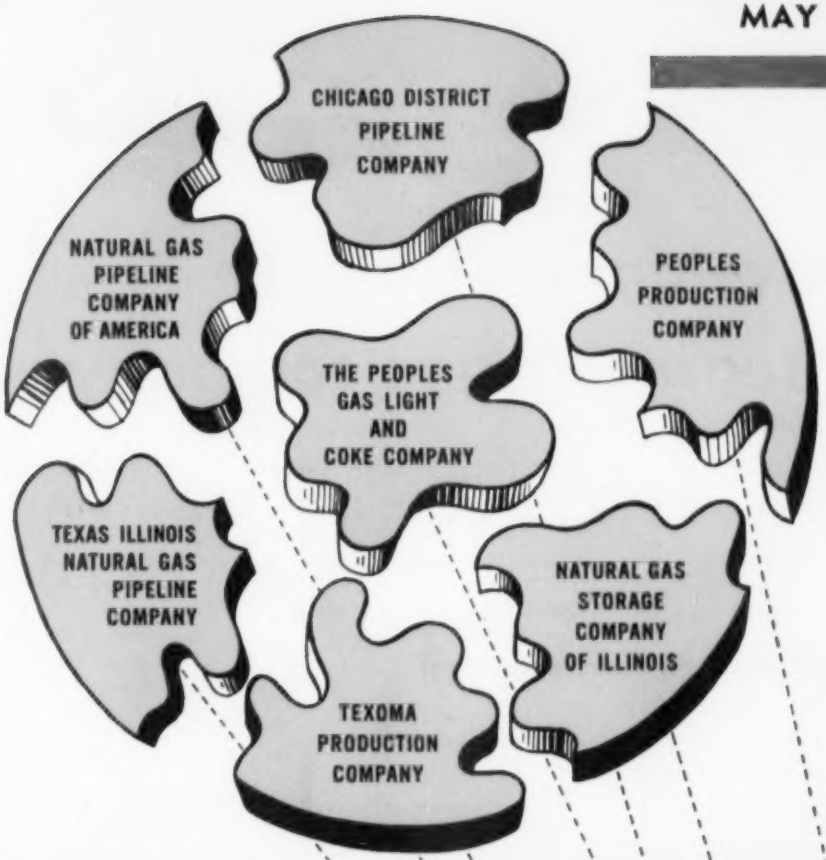
Yes, the Le Roi Tractair can give you performance like this around the clock — on all of your jobs. Applications are unlimited with Le Roi Tractair attachments. For example, the front-end loader attachment has many quick-change accessories — utility platform, fork lift, straight backfill blade, combination bucket and crane boom, crane lift, and several snow removal tools. Other attachments for the Le Roi Tractair are the backhoe, earth auger, rotary sweeper, backfill blade, snow blades, and many more.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

RD-42

GAS

MAY 1956

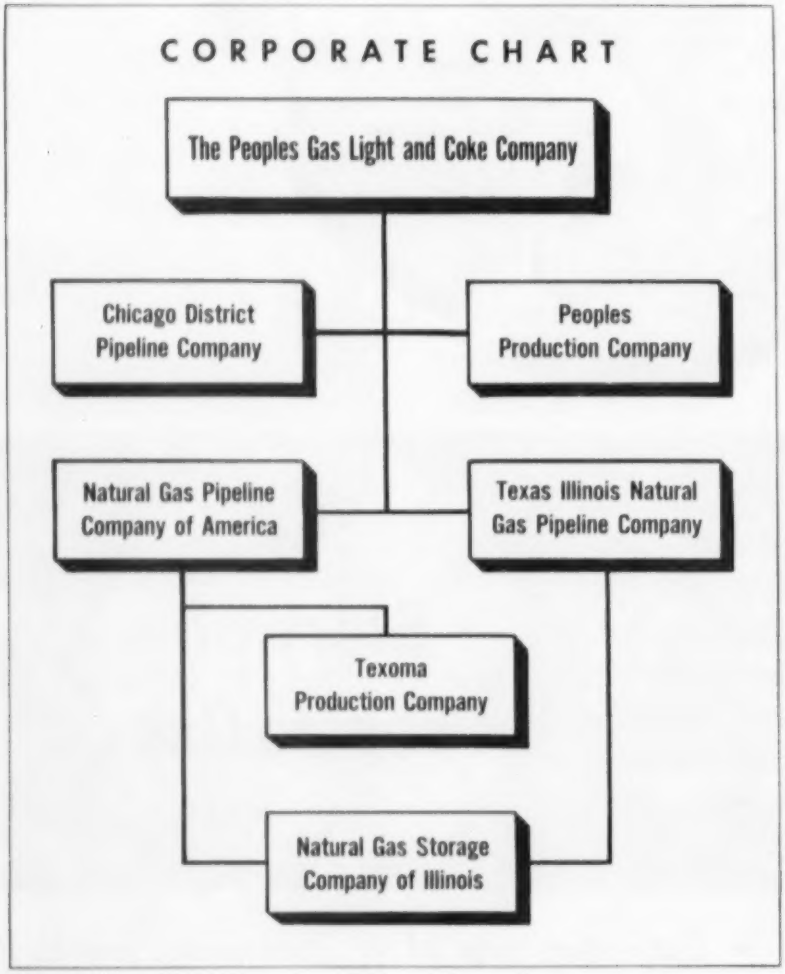

CHICAGO DISTRICT PIPELINE COMPANY
NATURAL GAS PIPELINE COMPANY OF AMERICA
PEOPLES PRODUCTION COMPANY
THE PEOPLES GAS LIGHT AND COKE COMPANY
TEXAS ILLINOIS NATURAL GAS PIPELINE COMPANY
NATURAL GAS STORAGE COMPANY OF ILLINOIS
TEXOMA PRODUCTION COMPANY

From the Gulf Coast to the Great Lakes—The Peoples Gas Light and Coke Co. system welds people, pipe, and equipment into the industry's most dynamic integrated gas company.

The Story of Peoples Gas

IN TWO PARTS • Distribution, page 54 • Transmission, page 151.

Development of an integrated gas company


CORPORATE CHART
The Peoples Gas Light and Coke Company
Chicago District Pipeline Company
Peoples Production Company
Natural Gas Pipeline Company of America
Texas Illinois Natural Gas Pipeline Company
Texoma Production Company
Natural Gas Storage Company of Illinois

By J. FRED EBDON • Editor

INTEGRATED gas companies have everything — exploration and producing operations, processing plants, transmission lines, terminal storage, and distribution systems—needed to assure their markets of adequate, dependable gas supply. The nature of their business, however, requires that they be founded on the basic concept of the industry—service.

The Peoples Gas Light & Coke Co., Chicago, is big. It is a complex of companies, long - distance large - diameter pipelines, compressor stations, a storage field, processing plants and control stations, and distribution systems. It is tied in with its own production in major gas supply areas and with wells of other producers in additional gas fields. It is a "gas industry" within itself. Regardless of the broad scope of its operations and the size of its plant and equipment, its single purpose is to deliver gas to its Chicago consumers and those of its 23 other utility customers. Peoples Gas has 100 years' experience in this purpose, but it is not standing still. Even now, it is fighting (in the way of American industry) to maintain and increase its service through the connection of additional gas supplies.

But, The Peoples Gas Light & Coke Co. is people. A chart (at left) shows the corporate set-up. Behind this chart is the heart of an integrated gas company—people with the know-how and will-do to allow for expansion

based on experience without letup in routine service of the highest order to every consumer. The operation of an integrated gas company by its nature means that these people must work together. At Peoples Gas, they do.

Chicago is west to the people of New York and the Atlantic coast; it is "back east" to those on the West coast; actually, Midwest describes it geographically when the human factors are ignored. In any case, it was really out west on Sept. 4, 1850, when gas was first turned into distribution mains at Chicago. The city was completely lacking in the comforts and utilities considered ordinary in most cities further east. Lamp oils, wax candles, winter sperm oil, whale oil, sperm candles, stearine candles, etc., were smudging lamp chimneys and doubtless the users were hardened to the noxious odors of burning whale oil. People streamed into the streets on that date in 1850 to watch the lamplighters turn on the first gas lights.

Thirty-six gas lamps sprung into glory in public buildings and in the homes and stores of 125 other customers. The excitement was climaxed when 99 street lamps in and near Lake street were lighted. The gas plant was located at Monroe and Market; the distribution system can only be described as simple.

These uncomplicated beginnings (by today's standards) were the results of five pioneer, enterprising residents who gathered on Oct. 16, 1848 to chart the course of the Chicago Gas Light & Coke Co., which preceded Peoples Gas by a few years.

Almost from the first, the biggest job of the utility serving Chicago with gas has been the problem of anticipating and keeping up with growing demand for gas service. This problem has been with Peoples Gas since it was given this name in 1855—it is with it today.

Gas service to Peoples Gas' consumers continued through Chicago's Great Fire of 1871. Service was maintained in widespread areas during this event and through the World's Columbian Exposition in 1893 when the "Gaslight Era" was at its height. Growth of its service area and customers kept the gas company "young."

Well before 1900, the Bunsen burner principle was applied to kitchen ranges and the load created by gas cooking was under way. Peoples Gas conducted gas cooking demonstrations on ranges set up in vacant lots in the early 1900's. The cooking volume of gas sales eventually became greater than that for lighting, which dwindled rapidly with the introduction of the incandescent light bulb.

During these hectic, but really interesting times, there was periodic consolidation of the many gas distributing utilities that sprung up in and around Chicago. For instance, 10 different gas companies were consolidated with Peoples Gas in 1897 and 1898; two more were added in 1907. From the different and variously located plants, holders, and distribution systems, Peoples Gas' engineers created a coordinated, efficient, city-wide distribution system to better serve all parts of Chicago under regulation that assures the service policies are in the public interest. The elimination of different and duplicate facilities has saved the ultimate consumers countless expense.

As the market for gas lighting faded, Peoples Gas turned to developing the market for gas cooking and, just after World War I, turned attention to building industrial and commercial utilization, in addition to the well established trend toward domestic usage. This program was effective. So effective, in fact, that by 1929 the company was facing its recurring problem of nailing down adequate gas supply to serve an ever increasing potential.

The dynamic management team at Peoples Gas decided to turn to natural

"We are chefs—not coal heavers" was the slogan of The Peoples Gas Light & Coke Co.'s sales promotion men during the early days of gas in Chicago. Traveling display shown in top photo was used to promote installation of gas cooking equipment in commercial kitchens. Lower photograph shows contrast between old coal kitchen and modern new all-gas installation.

Gas lights were used in many Chicago stores at the turn of the century. In this particular store, both gas and electricity were used for lighting.

gas as the answer to gas supply. This was logical, but it involved the construction of a pipeline from the Texas Panhandle to Chicago. This was a reasonable project—or was it?

True, many communities were being served with natural gas at this time, but there were no long distance pipelines running from one section of the country to another; that is, none connecting the Southwest with a metropolitan market in the north of the size and potential for growth as Chicago.

The pipeline was built. Natural Gas Pipeline Co. of America took $75 million and a lot of pioneering, welded all the factors together, and laid the first long-distance, large-diameter, high-pressure steel pipeline connecting Chicago's consumers with Texas' huge gas reserves. Peoples Gas provided its share of the construction costs and became holder of a minority interest in Natural Gas Pipeline.

Natural Gas Pipeline Co.'s 24-in. OD line started delivering natural gas to Chicago at 4 p.m. on Oct. 16, 1931—right in the middle of the depression. The natural gas was mixed with manufactured gas to raise the sendout from 530 Btu to 800 Btu. With the economy in a jumble, Peoples Gas was paradoxically faced with over-supply brought about by conscientious efforts to prevent under-supply. But, as the economy recovered, people in Chicago turned to gas heat for their homes to provide the ultimate in comfort and eliminate the ultimate in discomfort—furnace tending. Gas for domestic space heating was well entrenched in Chicago by 1940.

The good business days of the recovery era were turned into booming business days by the threat of impending World War II. When America entered this war, with all-out production immediately following, still more and more gas was needed in the Chicago area to accommodate the many new ways in which gas was utilized to serve industry.

The "post war slump" that filled the public's mind failed to materialize in the Metropolitan Chicago area. This industrial center needed more natural gas to mix with manufactured gas being produced at maximum capacity by Peoples Gas. These needs culminated in Natural Gas Pipeline Co. of America building a second pipeline paralleling its original facility. Late in 1948, just prior to the completion of Natural Gas Pipeline's second line, The Peoples Gas Light & Coke Co. acquired all the stock of the two pioneering companies that were producing, gathering, and operating the transmission facilities. One of these companies was Texoma Natural Gas Co., the producing agency in the Texas Panhandle gas field. The other was Natural Gas Pipeline Co. of America, which operated, and still operates, a 24- and a 26-in. OD pipeline to the Chicago markets.

Thus, Peoples Gas became an integrated gas company. It gained control over exploration activities, its own gas supply, and the fully integrated physical system that extends from the producing strata in gas fields to the appliances of its customers and to the town border stations of its utility customers.

This step was not the final one taken by Peoples Gas management to assure its customers of continuous supply, to enable it to add new customers in all classifications to its mains, and to provide all the customers who want it with space heating gas. The acquisition of the producing and pipeline properties helped pave this way for another major transmission line.

In June 1950, a newly formed Peoples Gas affiliate—Texas Illinois Natural Gas Pipeline Co.—received certification from the FPC to construct a 30-in. OD steel pipeline from the Texas Gulf Coast to the Chicago area. In December 1951, natural gas was flowing through this steel conduit from unaffiliated production companies all along Texas' lower Gulf Coast. Chicago then had the security and volume afforded by a dual gas supply; one linked to the market area by twin big-inch lines, the other linked by a single, more modern, big-inch system.

But the management of People Gas under the leadership of its service-minded, dynamic board chairman, James F. Oates Jr., is not content to rest on its laurels and dual gas supply as long as there is a customer in Peoples Gas' service area who lacks space heating gas or gas for any other reason. The quest for new, additional gas supply goes on as plans for a third separate pipeline system to connect still another gas supply area to Chicago were announced in February of this year. If the FPC approves, gas from the San Juan Basin fields, other fields in the underdeveloped Rocky Mountain area, and possibly even Canadian gas will be pumped by new compressor stations and will flow to Chicago in a new 30-in. and 36-in. OD Natural Gas Pipeline Co. pipeline system.

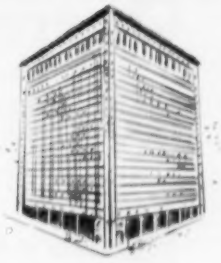
The Herscher storage project is well known to readers of GAS*. This major storage-at-the-market field is also being expanded. In short, we know of nothing that isn't being done to bring natural gas to Chicago in increasing volumes even while the population itself is increasing. We also know the people of Peoples Gas, Natural Gas Pipeline Co., Texas Illinois, the Storage Co., and the producing companies; therefore, we know that these are not the final efforts. The new projects and new plans will soon enough be just other stepping stones along the history of an integrated gas company that has the energy and ability—and most important, the people—to serve its consumers in the best tradition of the gas industry.

*"Herscher: First Use of Water Sand for Natural Gas Storage," GAS, August 1955, p. 107.

THE
PEOPLES GAS
LIGHT AND COKE COMPANY
AND SUBSIDIARY COMPANIES

JOSEPH J. HEDRICK
President
Natural Gas Pipe Line Co. of America
Texas Illinois Natural Gas Pipeline Co.

ESKIL I. BJORK
President
The Peoples Gas Light & Coke Co.



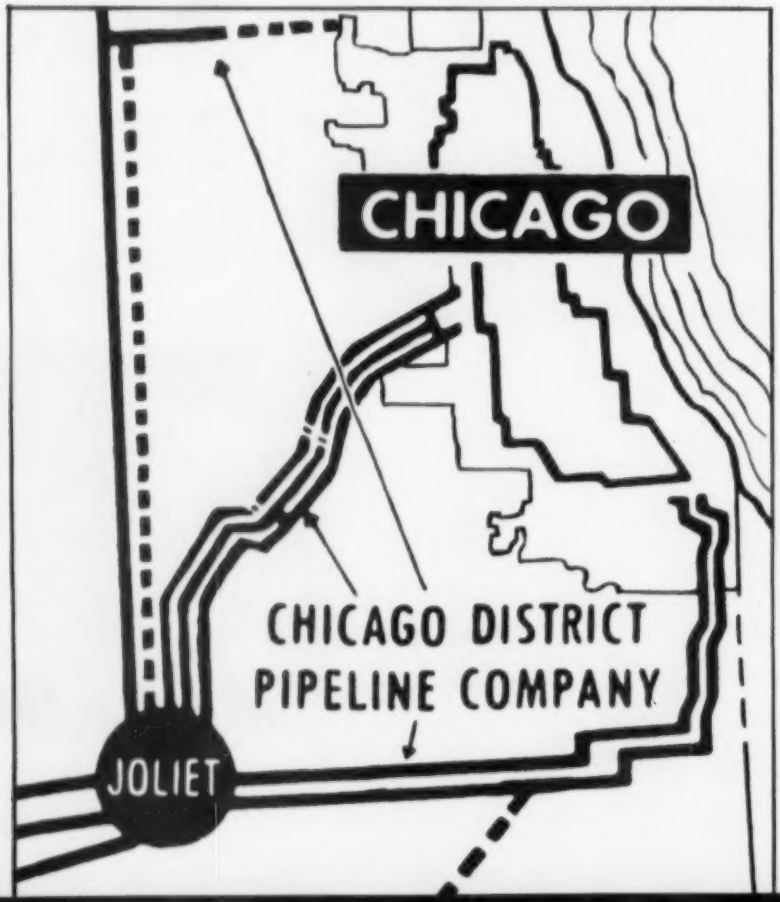
JAMES F. OATES JR.
Chairman of the Board
The Peoples Gas Light & Coke Co.

MARK V. BURLINGAME
Vice President
Natural Gas Pipe Line Co. of America
Texas Illinois Natural Gas Pipeline Co.

KARL B. NAGLER
Vice President, Operations Division
The Peoples Gas Light & Coke Co.

Joliet meter station is the terminal point for transmission lines of Natural Gas Pipeline Co. of America and Texas Illinois Pipeline Co. From Joliet, gas is distributed to Chicago and other midwestern cities.

Operation of an integrated system



THE effective terminals of the two lines of Natural Gas Pipeline Co. of America and the single line of Texas Illinois Natural Gas Pipeline Co. are at a metering and pressure regulating station near Joliet, Ill. Here Chicago District Pipeline Co.—another subsidiary of Peoples Gas—takes the gas from the pipelines, and gas from Herscher storage field, for transmission to (1) The Peoples Gas Light & Coke Co., (2) Northern Illinois Gas Co., and (3) Northern Indiana Public Service Co.

These three utilities, in turn, introduce the gas into their distribution systems for retail sale. Peoples Gas is the major distribution outlet as it serves the one million plus meters within the city limits of Chicago.

Chicago District Pipeline Co. has a system of three lines (24-in., 24-in., and 30-in., respectively) connecting Joliet pipeline terminals with the Crawford station, on the west-central side of Chicago. Then, Chicago District has dual 24-in. lines from Joliet into the Calumet station, in the southeastern part of Chicago, and a single line into Howard street. The three Joliet-Crawford lines are 35 miles long, the dual Joliet-Calumet lines cover 43 miles, and the Howard street pipeline is 12 miles where it connects with the Northern Illinois gas system. Plans are underway to extend the Howard street line eastward 14 miles to feed the Peoples Gas system on the north side of Chicago.

Along these lines are a number of taps to Northern Illinois and Northern Indiana distribution systems.

Peoples Gas serves million customers

THE PEOPLES GAS LIGHT AND COKE COMPANY

THE Peoples Gas Light & Coke Co.'s distribution system is big. It is big by any measure you care to apply to its operations. However, it is not so big that it has forgotten service to the individual customer is the basic criterion of the gas distribution business. Chairman of the Board Oates sums it up this way: "The public is entitled to the best gas service possible. We will serve our markets. The Peoples Gas family has done a good job and we will continue to search for new additional gas supplies in order to better the service in the future."

The distribution system was founded on the basis of manufactured gas for the send-out product. Huge coke ovens and water-gas manufacturing works were spotted throughout Chicago as the distribution facilities grew. With the advent of natural gas supplies in 1931 to augment manufactured, mixing installations were built to control the proper blend between the two fuels to 800 Btu. This mixture was raised to 900 Btu when additional supplies of natural gas were delivered in 1952. As more and more natural gas became deliverable to Peoples Gas, a planned conversion sequence was put into practice to bring the utilization equipment into step as the heating value of the send-out gas was raised. This conversion sequence is a story within itself. The system will then be operating on 1000 Btu/cu ft send-out gas. The manufacturing operations will be reserved for peak shaving.

Crawford station was the principal gas manufacturing plant among Peoples Gas' 15 gas production or distribution plants. It still is a major distribution center as three Chicago District pipelines flow natural gas into the Peoples Gas distribution system at this point.

Another main supply point is the Calumet station where twin Chicago District pipelines feed gas into the Peoples Gas distribution system on the southeast side of Chicago. As the natural energy replaces the tremendous man-made facilities, the great coal stockpiles, conveyors, grinders, and coke ovens that have served so well will soon be faded from the scene. Both Crawford and Calumet stations will then be major town border stations—actually, they are today.

The city of Chicago sprawls over a 213-sq mile area in a saw-toothed rectangle 26 miles long and 5 to 11 miles wide running generally north and south along the shore of Lake Michigan. Although the family of companies integrated to form the Peoples Gas system delivers gas to town border stations throughout the six midwestern states, the parent company's distribution system is confined to the Chicago city limits. Within these limits are about 3.62 million people served gas through the 1,004,652 million meters installed in the Peoples Gas distribution system.

It is significant to note that the one millionth meter was installed by Peoples Gas on Aug. 29, 1955, in an all-gas home. At that time, James Oates remarked, "The histories of Chicago and our company are parallel in that both

Construction crew uses crane to move section of 24-in. cast iron pipe into place in Chicago's La Salle street.

Peoples Gas crew installs new cast iron main in Chicago with side-boom pipe layer.

have shown vigorous growth in the last century. The city has developed from a frontier town to nearly 4 million people today and Peoples Gas now has 1 million meters in service in Chicago to make it one of the largest gas distributing utilities in the nation." Mr. Oates rededicated Peoples Gas to the "... continuance of the same high standards of public service," on the occasion.

This high standard starts with the dual source of natural gas supply and begins to take shape distribution-wise at the Crawford and Calumet town border stations. From these points, roughly 60 miles of 36- and 48-in. diameter cast iron mains effectively loop the city to afford a main medium-pressure belt. This large-diameter loop system is operated with a maximum pressure of 25 psig. Generally, 20- and 24-in. cast cast iron medium pressure feeder mains, totalling about 220 miles, take off from the supply loop to feed the district regulators.

About 200 district regulator stations are spotted strategically within the distribution system to reduce feeder main pressure to utilization pressure, which is predominantly 6-in. wc. From the district regulator stations, low pressure feeder mains take off to supply frontage mains at utilization pressure to form the reticular system.

Six-inch nominal diameter cast iron pipe forms the bulk of the mains which distribute gas at utilization pressure. About 90% of the entire distribution system piping is operated at less than 2 psig. The cast iron piping has produced very reliable service in the distribution system — part of which is more than 100 years old—and has exhibited excellent resistance to corrosion in the particularly corrosive soils of streets filled in many years ago to raise the general street level of a large section of the city. For this reason, the distribution system operated by Peoples Gas is essentially one of cast iron pipe. The company is at present experimenting with ductile or nodular iron piping.

Peoples Gas engineers have developed an "ideal square mile" standard for distribution system design. This is essentially a medium pressure main feeding into a district regulator station centrally located within the square mile physical layout. The district regulator makes the pressure cut and delivers to a feeder main that cuts through the heart of the square mile. From it, 16 mains, eight on each side of the district regulator tie-in point, project into the ideal square mile service area.

This design standard is considered advantageous because with a 16-in. feeder main supplying 6-in. distribution mains taking off from it, it can adequately supply the square mile area with large volumes for space heating without excessive pressure drop. It has been established that for conditions in Chicago this design technique allows for approximately 75% space heating saturation in addition to the base loads within the square mile limit.

Proper district regulator spacing (ideally, one per feeder main mile) allows adequate delivery at a permissible pressure drop at the extreme low pressure points. The low pressure points are theoretically found at the junction of two "ideal square mile" sections, which gives them a twin feed and, therefore, a means of maintaining a supply in the event a regulator is shut down for various reasons. One of the advantages of this design concept is the fact that the correct spacing of district regulator stations results in the ability of a 12-in. feeder to do the job that would require a 16-in. counterpart under less ideal conditions.

The design square mile is closely coordinated with a market research department at Peoples Gas. This group can supply the engineering department with load information, broken down into square miles. They have the entire city of Chicago arranged into these square miles—each is numbered.

Market research can supply information the engineering department needs for design or revamping any square mile within the city. Such data as maximum hour, maximum day, and minimum hour are available for each of the square mile sections.

Certain information is available to market research from meter cards. Each meter card has the address and the square mile location, together with the average consumption. They will make a special run on IBM equipment dur-

ing the winter months and these data are used to obtain the maximum hour, the minimum hour, or average hour, the square mile location and the class of business, etc. They have nine different classifications of business and can develop particular loads for any given area that the engineering design section calls for.

Data are also developed with respect to installed heating plants, water heater, and range saturation, for any particular square mile of the distribution system. There, only progressive steps are needed for market research to predict the future and what the probable growth will be on the basis of the saturation of new appliances in relation to old appliances, and many data of a similar nature.

The ideal square mile originated in connection with system design, and the load data required for design purposes has been developed to make it available by square mile areas. Accuracy of load data is maintained by comparison with actual load experiences and this basic information lends itself as needed for estimating future loads. The square mile design concept, then, is not a guess —it is a refinement based on scientific study and research.

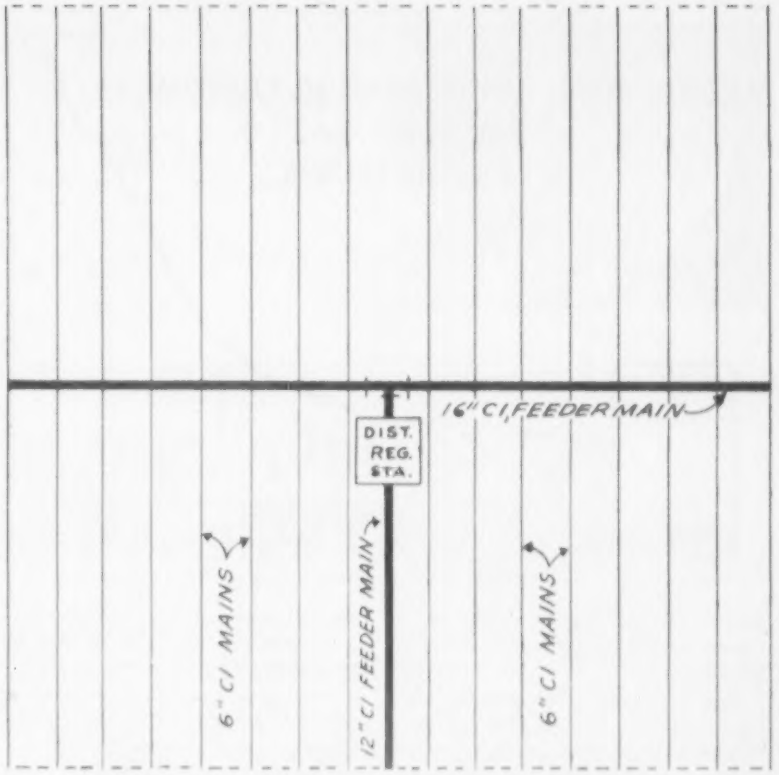
As in all distribution systems, the area served by the Peoples Gas distribution system does not fit into ideal conditions in all cases. Exceptions have to be made in relation to varying load and physical conditions; however, the ideal square mile design has proven fundamentally sound.

When it is possible, Peoples Gas prefers to lay feeder mains in streets with parkways as this is obviously more economical than installation under paving. Traffic is also given heavy consideration in route selection, as is the congestion of underground structures.

District regulator stations are usually installed in underground vaults to eliminate any interference in or by the life of the bustling city. Vaults are either concrete or steel and are designed with a cubical content of less than 200 cu ft as the ASA B31.1.8-1955 code does not require venting for vaults of this size. The regulator station design is rather straightforward, but efficient and serviceable.

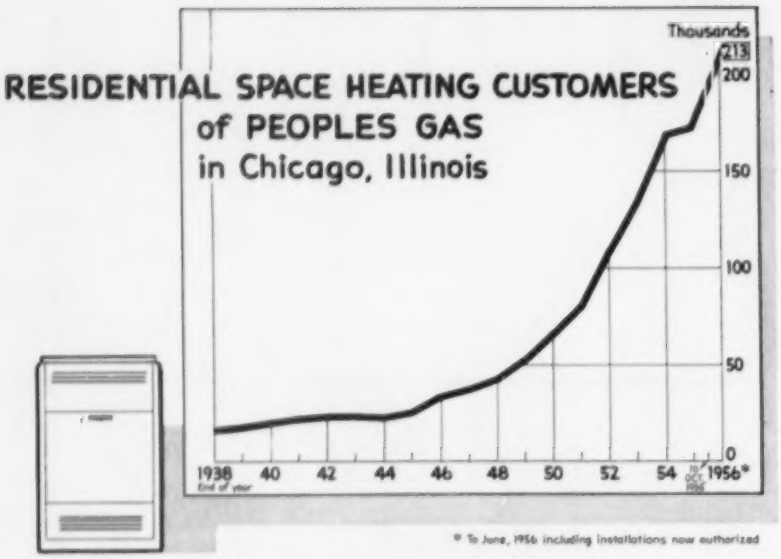
Peoples Gas studies its distribution system extensively with modern methods. Pressure surveying and peak load study, in relation to pressure maintenance, is an established policy. Network analysis usually is done with the aid of a slide rule and an analogue network analyzer, while digital punch-card equipment has been used. The big problem always present is how to make system reinforcements adequate and economical as Chicago continues to grow and produce additional gas loads.

The Peoples Gas dispatcher acts for the Chicago District Pipeline Co. as well, and coordinates gas supply matters with Natural Gas Pipeline and Texas Illinois. Availability and allotments of gas come from the pipeline company dispatchers and the Peoples Gas dispatcher breaks it down among



The Peoples Gas Light & Coke Co. has developed an "ideal square mile" standard for its distribution system design. This system, as shown above, is designed to adequately supply the square mile area with large volumes for space heating without excessive pressure drop.

Modern electronic machine accounting methods are used by Peoples Gas. Here a supervisor explains operation to a group of trainees in the customer accounting department.



Peoples Gas and the other utility customers served from Chicago District pipelines.

Flow is controlled by policing the hourly takes by Peoples Gas and the other utilities. Some of these are telemetered in while others are phoned. Pressure and volume data from major take-points are usually telemetered in to the Peoples Gas dispatching office.

During periods of cold weather, the Peoples Gas dispatchers try to anticipate expected load volumes by analysis of mean temperature forecasts, wind velocity, and snow cover. Another factor in their work is the terminal storage capacity at the Herscher storage field. This tremendous delivery capacity essentially at the market area is available to the various utilities.

Each utility participating in the storage project under the direction of Peoples Gas and its subsidiary, Natural Gas Storage Co. of Illinois, has an allocated volume of gas in storage. Each utility, in turn, sends in its estimate of total take and the part of this take that they wish to withdraw from storage. From storage, delivery is then on a take-or-pay basis, unless an early revision is given. Peoples Gas dispatching coordinates these operations.

The conversion program to change-over utilization equipment from the 900 Btu manufactured gas and natural gas mixture to 1000 Btu basically natural gas was started in 1955. Needless to say, the over-all program is a large undertaking. It required the initiation of special service schools, the addition of many men to the company's personnel, and investigation and research into conversion procedures to be used on gas-burning equipment.

Some of the conversion work is being done in conjunction with routine calls for service, such as when changing meters on a periodic basis or when called to make a central heating system inspection or other service request to adjust appliances. House-to-house visits will be made to complete the adjustment. Any way that you look at it some million-and-a-quarter premises have to be visited by conversion technicians from Peoples Gas.

One can imagine the problems involved with training a force capable of handling conversion of all manner and makes of appliances. The large number of premises that have to be visited on a routine schedule formed a respectable task in planning and logistics. Approximately 900 servicemen and specialists are directly involved in the conversion with perhaps 200 of them working full-time on this project.

The organization of Peoples Gas is shown on Page 54. Such a chart is inadequate for telling the story of men, and their experience, behind the operations of this distribution company. The foundation for the company is the dual gas supply for its service area — the heart is the people who stand behind the company and get the job done.

Gas demand for space heating has been increasing in Chicago (the same is true for the service areas of the other utility customers of the Peoples Gas system) at a rate that has exceeded the ability to supply it in spite of the all-out efforts by Peoples Gas to bring this much wanted service to each of its consumers who wants it. Even with the 213,000 authorized residential space heating customers that are currently connected, there are about 95,000 individually heated dwelling units in Chicago that are still on a waiting list for this convenient service. Further development of the Herscher storage field and the connection with a third, major gas supply (if approved by the FPC) will be key factors in determining how soon gas space heating can be brought to these 95,000 families and to others in the city.

Space heating is not the only load in which there is potential for growth in Peoples Gas' distribution area. The cooking load can be further developed by population and dwelling unit increases. It is more or less limited to these increases because Peoples Gas already enjoys a more than 90% share of the residential cooking market in Chicago. They are justly proud of this achievement. Last year, more than 9 out of every 10 ranges sold in Chicago were modern gas ranges. It should be remembered that this record was made in a very competitive market. Peoples Gas credits strong sales promotion and advertising, plus employee effort, with this success. They plan to continue this advantage.

Peoples Gas is doing well in the water heater market too. About 75% of the families living in single family homes and two-unit apartments use gas for water heating, and sales of the very practical and inexpensively operated automatic gas water heaters are continuing at a rate of more than 25,000 per year.

Over 26,000 gas-heated or fired clothes dryers have been placed in Chicago homes during 1955 and active promotion is underway to build a domestic gas-fired incinerator market. Both of these appliances have a great potential. About 12% (150,000 units) of the dwelling units in Peoples Gas' distribution area use gas-operated refrigerators.

So, in addition to operating a big efficient physical distribution system with two separate natural gas supply areas to draw from, Peoples Gas is sales, promotion, advertising, and service minded. Public service is their first consideration with the effort of all their people and facilities directed at giving the public in Chicago the quality-type of service an integrated operation can produce.

Natural Gas Storage Co. of Illinois' huge underground storage facility at Herscher has made it possible for Peoples Gas system to supply nearly 50,000 new space heating customers since it was put into operation in 1954.

Terminal storage is big factor in growth of Peoples Gas system

UNDERGROUND natural gas storage at Herscher, Ill. is a prime factor in the growth potential of the Peoples Gas integrated system. The Herscher project represents a storage point on the terminal end of the giant pipeline facilities operated by transmission members of the Peoples Gas family. The storage reservoir is an aquifer and marks one of the first efforts within the gas industry to utilize this type of reservoir for storage.*

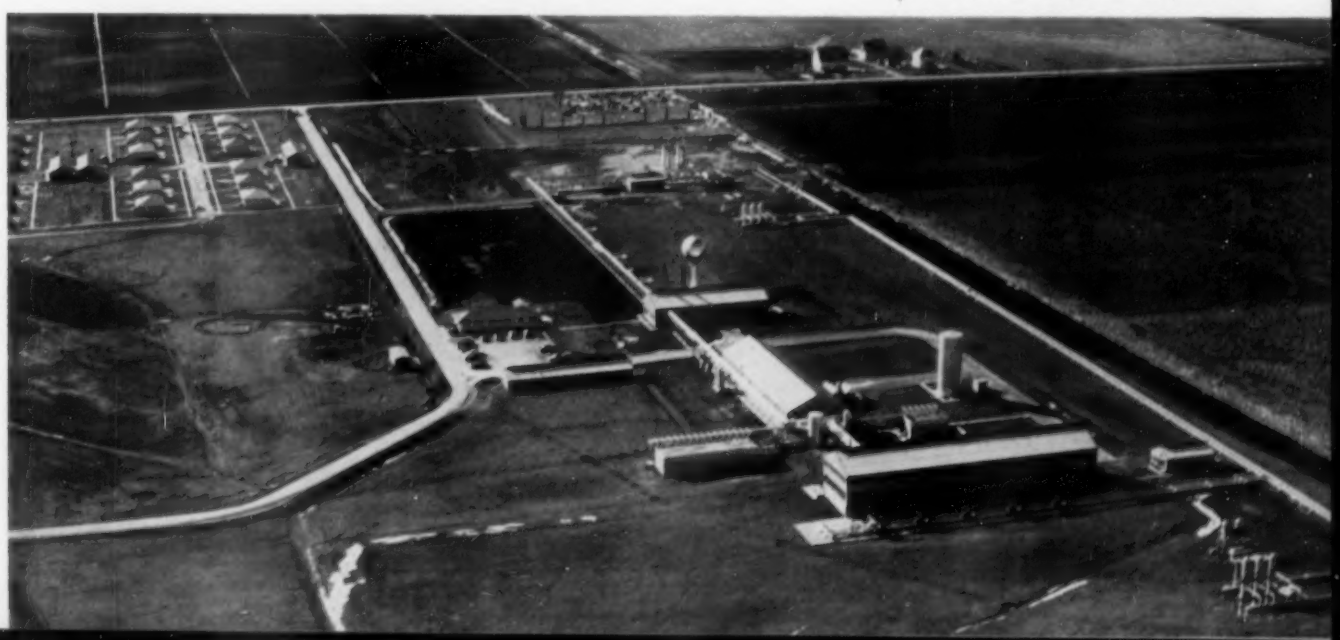
The last two groups of space heating customers that were authorized to be added to the Chicago distribution system lines—7500 in September 1954, and 40,000 in August 1955—were directly attributable to the successful development and operation of this storage facility. Other utility customers withdraw gas from storage in volumes that allowed 60,000 additional space heating customers to be added to their lines.

The Herscher storage project is operated by Natural Gas Storage Co. of Illinois, another group in the Peoples Gas family of integrated companies. The facility has had its problems during the period of experimenting and feasibility study, but now it is operating commercially and its expansion is under way.

Initially, the storage field had a peak day deliverability of 150 MMcf. In August 1955, the FPC granted a certificate to Natural Gas Storage for the further development and expansion of the operation. The first step in the expansion was the construction of a $1.5 million gathering system to recover gas that had been escaping from the storage reservoir. The volume of this venting gas was large enough to warrant con-

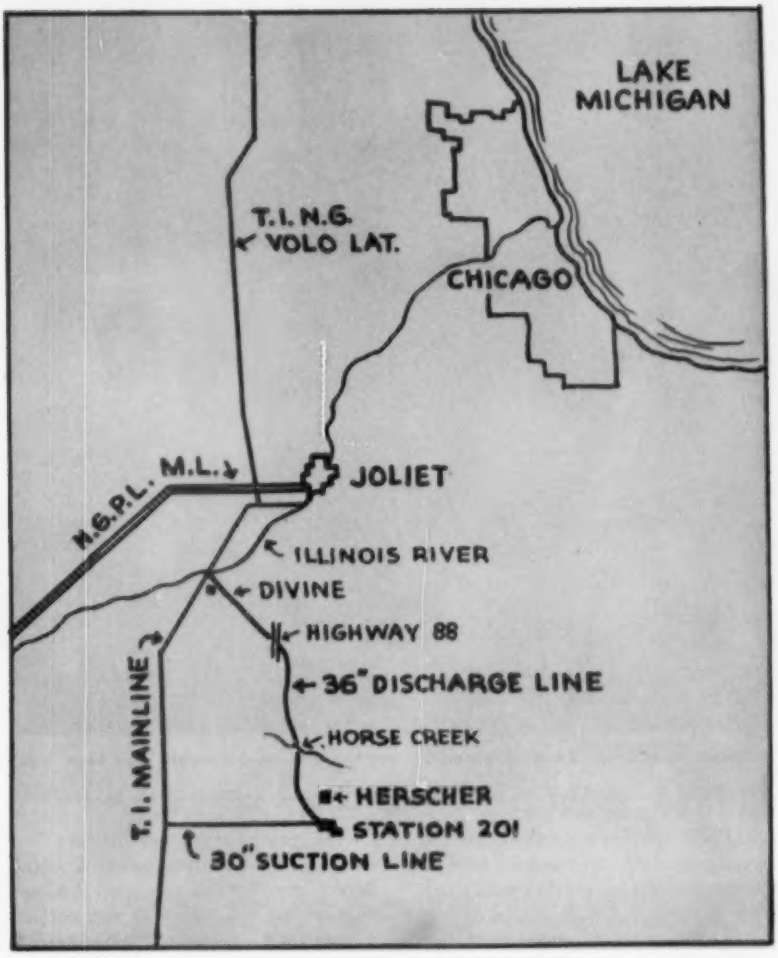
*"Herscher: First Use of Water Sand for Natural Gas Storage," GAS, August 1955, p. 107.

The underground natural gas storage facility at Herscher, Ill., is operated by Natural Gas Storage Co. of Illinois. Here gas is stored for use by distribution system during peak load periods.



Pipelaying crew strings giant 36-in. OD pipe during installation of line from Herscher connecting with Texas Illniois pipeline.

Welders work on 36-in. line from Herscher at spot where it crosses U. S. 66. Crossing was made in open cut because of rock.



A new 36-in. discharge line connects the Herscher storage terminal with Texas Illinois Pipeline Co. line 12 miles southwest of Joliet.

struction of the gathering system, but actually was minor in relation to the total potential volume of the field. A pilot plant gathering system was operated in late 1954 and early 1955 to demonstrate the practicality of the recovery efforts. Following approval by FPC, the full-scale gathering system was made operational.

The gathering system consists of 4.2 miles of various sized pipe tying-in 25 vent gas gathering wells and two water disposal wells with desulfurization equipment, cooling towers, and other components. Compressor facilities are available to repressure the vent gas for reinjection in the reservoir formation. The vent gas gathering system has a capacity of 17 MMcf/day—more than the maximum amount of gas that has ever vented in any day since the leakage first showed up in 1953.

A second big step in the exploitation of Herscher's capacity as a storage field was taken on Dec. 30, 1955, when a 31-mile section of 36-in. OD pipe went into operation to connect Herscher (Station 201) with the Texas Illinois pipeline at a point about 12 miles southwest of Joliet. In essence, this pipeline forms a direct connection between the storage field and the market.

The $5.2 million 36-incher was kicked off on Sept. 19, 1955, by Contracting & Materials Co., Evanston, Ill., with right-of-way clearance work. On Oct. 10, the first joints of 36-in. pipe arrived at the Herscher railhead and stringing started. The pipe weighed 6000 lb/joint and had a 0.4375-in. wall.

Equipment to handle this pipe had to be massive. The trencher — largest wheel-type ditching machine in use— made a cut 52 in. wide by 8.5 ft deep. Three-hundred amp welding generators mounted on diesel-engined "cats" equipped with Athey pads were used on the firing line. Welding was started on Oct. 19, and the crew grew from 14 to 23 welders in the first two weeks. These crews averaged welding 1700 ft of pipe per day. To speed the work, the contractor increased the welders, so from 28 to 33 men were used between that date and Dec. 5—the output averaged 2601 ft per day during that period.

A newly designed air powered, hydraulically operated, internal line-up clamp, supplied by Perrault Brothers, was used. This clamp is designed to permit selective application of pressure at any given point of the pipe's circumference, thus facilitating line-up and aiding in the production of a better weld. A Cinch uplift hydraulic pipe bender made the smooth cold bends in the 36-in. pipe to fit it to the trench.

Cleaning and priming, and coating and wrapping were done in the field with Perrault Brothers machines with sideboom tractors cradling for them.

The 36-in. line was field coated with Lion E-120 asphalt base enamel to company specifications ranging from 1/16- to 3/32-in. thickness. A fiber glass wrapper was spun on and followed by a kraft paper outer wrap. This was the company's first departure from coal-tar base pipeline enamel.

The 31-mile line crossed 17 highways and railroads requiring casing. U. S. Highway 66 posed a special problem because an open cut had to be made due to rock. Blasting and drilling were in order. Cave-ins and a high water table required the installation of standard and special matting at a crossing in Horse creek.

The block valves were installed on 10-mile spacing. Cleaning and testing were carried out as each 10-mile section was completed. The cleaning and testing programs were performed by personnel from Texas Illinois Natural Gas and Natural Gas Storage Co.

This is the largest diameter steel line in operation within the Peoples Gas system, but it is interesting to note that Natural Gas Pipeline Co. of America plans 389 miles of this big pipe for its new line to bring gas from the Rocky Mountain production areas, if FPC approves the project.

The third phase of the expansion for Herscher storage is the injection of additional cushion gas to allow for the peak withdrawal—430 MMcf/day. The additional cushion gas will be injected during the summer of 1956 when the pipeline load factor is reduced. This will make it possible to withdraw for

Regular and special matting were required where line crossed Horse Creek. Lowering-in operation was hampered by cave-ins and high water table.

the several distribution company customers at the peak rate during the heating season of 1956-1957.

Injection of initial cushion gas started in the spring of 1953 and the injection of top or withdrawal gas began in the fall of that year. Customer companies were served with storage gas on a commercial basis for the first time during the winter season of 1953-1954.

As the 1954-1955 heating season began, about 18 billion cu ft of gas had been injected into the storage reservoir. During that season, gas was withdrawn from Herscher for the accounts of customer companies on several occasions. During a 24-hr test period that ended on March 15, 1955, during which the pipeline deliveries were substantially restrained, 435 MMcf were taken from storage and delivered to market to demonstrate peak condition operation.

The peak operational delivery for the 1955-1956 heating season was 300 MMcf/day. At this rate, one third of the heating customers in the city of Chicago were operating their plants on storage gas. When the peak 430 MMcf/day delivery is reached, it is estimated that 45% of the natural gas required in Chicago for househeating can be withdrawn from the Herscher field. Its importance to the Peoples Gas service area is obvious. Maximum utilization of storage gas will occur during the theoretical peak day when the mean low temperature is —7° F.

Peoples Gas officials consider the 430 MMcf/day peak deliverability of Herscher to be approximately equivalent to the peak day capacity of a 30-in. OD pipeline. The capital cost of the Herscher storage project will be $25 million as compared with a cost of seven or eight times that amount for the construction of such a large-diameter, long-distance pipeline. ■

Large fleet of welding equipment, equipped with special tracks, was used by pipelayers during construction of line from Herscher.

Crews install 30-in. pipe at Encanto equating station. Additional pipe makes available storage facilities for 13 MMcf of natural gas.

San Diego goes underground to increase storage facilities

By A. W. RICHARDS, Assistant Engineer • San Diego (Calif.) Gas & Electric Co.

Faced with the need for more storage facilities to meet the demands of ever-increasing population, San Diego Gas & Electric Co. decided to enlarge its underground holder. Now, they have a high-pressure holder with a capacity of 13 MMcf, which can be filled completely by compressors in eight hours.

TWENTY years ago, the San Diego Gas & Electric Co. supplied natural gas to 67,000 customers. At the end of World War II, the count had increased to 105,000. Sometime during the spring of 1956 the 200,000th customer will make application for service. These phenomenal gains have, of necessity, prompted some rather substantial additions to the company's transmission and distribution systems. One of these is a high-pressure pipe-type holder, located in Encanto, a suburb a few miles northeast of San Diego.

Prior to 1953, the daily system equating was accomplished by packing the two transmission lines supplying gas to the San Diego area, and, secondly, by use of low-pressure holders capable of storing a total of 9 MMcf. The limitations of these facilities, as applied to anticipated loads, provided adequate justification for additional equating capabilities. Also, it was felt that the propane-air plant, designed to produce 36 MMcf/day for approximately two and one-half days, would become increasingly inadequate for emergency situations unless supplemented in some manner.

Dual requirement

This dual requirement prompted a study of the feasibility of expanding the propane-air plant; however, it was apparent that this would fall short of fulfilling the needs. Further study was

Trenching machine was used during expansion of San Diego Gas' underground high-pressure holder at Encanto. Here the machine is digging trench 42 in. wide for installation of 30-in. pipe. Pipe was laid to give minimum backfill of 3 ft.

View of liquid collection system at San Diego's new holder at Encanto. Picture was made during construction.

directed toward construction of a high-Btu oil-gas plant, a reformed-gasoline plant, liquefied natural gas storage facilities, and both low and high-pressure holders. Based on particular requirements, adaptability to the system and comparative costs, it was concluded that the high-pressure storage plant would serve the needs most efficiently and economically. The initial plan was to provide underground pipe-type storage of approximately 10 MMcf with sufficient compressor horsepower to enable 24-hr filling. It was planned to augment these facilities in 1955 with additional compressors to attain an 8-hr filling rate plus an additional 3 MMcf of net storage.

Pressure selection

A prime consideration in planning a high-pressure holder is selection of optimum operating pressure. If compression costs are not considered, the most economical storage pressure would be in the neighborhood of 2240 psig. In this situation, it was apparent that compressor costs would constitute a substantial part of the plant investment in view of the 8-hr filling feature that was required. Calculations favored selection of 925 psig as the operating pressure which would result in the lowest *total* cost for holder plus compressor station. Other factors which influenced this decision were: (1) No requirement for dehydration equipment; (2) Availability of pipe from West Coast fabricators.

On the basis of availability and comparative ease of handling, 30-in. OD pipe with 7/16-in. wall thickness manufactured under API specifications 5LX Grade X52 was selected as the storage medium. With California Public Utilities Commission General Order #94A and the American Standard Code for Pressure Piping (ASA B31.1-1951) as guides in design, it was determined that a maximum working pressure of 983 psig could be realized. Further, it was determined that 1250 bhp would provide compressor capacity sufficient to meet the initial 10-MMcf filling requirement in the desired 24-hr period.

San Diego Gas' secondary construction phase in 1955 included an additional 2000-bhp compressor to make possible the 8-hr filling feature. Simultaneously the company installed enough 30-in. pipe to increase the total net storage to approximately 13 MMcf. It was necessary to increase the pipe wall to 0.473 in. for this second phase in

order to maintain a maximum working pressure of 983 psig and still comply with the ASA Code revision (ASA B31.1.8) which became effective in 1955.

The completed installation as it stands today is built on a 16.5-acre plot. A 3600-sq ft building houses the two compressors, pressure-regulating apparatus and control equipment for local or remote operation of the plant. The balance of the plot contains 48,806 lineal feet of 30-in. OD pipe fabricated so as to produce 72 individual pipe strings manifolded into eight separate groups.

Holder design

Individual strings consist of specified lengths of 30-in. pipe fitted at each end with semi-elliptical heads. A 2-in. nozzle is attached to each high-end head to accommodate filling and discharge of gas. The high and low ends each have 2-in. lateral connections and 2-in. siphon-type connections, respectively, which, though normally capped, provided a simple means of supply and removal of water for hydrostatic test. To each filling nozzle is attached an expansion loop 3 ft in diameter, which, in turn, is connected to a 6-in. header. The low end of each pipe string is fitted with a ¾-in. connection which is attached to a 2-in. header and storage reservoir designed for collection of liquid accumulations. Appropriate valving is included to facilitate removal of liquids; however, experience to date indicates that the company should have little trouble in this regard.

The main header system consists of a series of eight 6-in. headers each accommodating a series of from 7 to 10 individual pipe strings. Each of the eight group headers is connected to a common 10-in. header which serves as the main holder filling-discharge line. The group headers are equipped with 6-in. valves which make possible the isolation of any group or combination of groups in the holder system.

Grading

Grading plans provided holder piping with an average slope of 4½% to facilitate removal of liquids. It was necessary also to accumulate excess spoil material to cover the buried pipe as it was the desire to exceed the minimum cover requirements specified by the code. By obtaining proper surface grade at the outset and preserving it with reasonable care during the ensuing construction, trenching was greatly simplified and only occasional checks were necessary to assure that the pipe was being placed at grade. Excess spoil from grading was stockpiled on the site at a location permitting convenient redistribution over the holder during final phases of construction. A minimum of 3 ft of cover was provided after final grading and compaction were accomplished.

This photograph shows fabrication of headers during the construction period at San Diego Gas' recently enlarged underground holder at Encanto.

Trenching

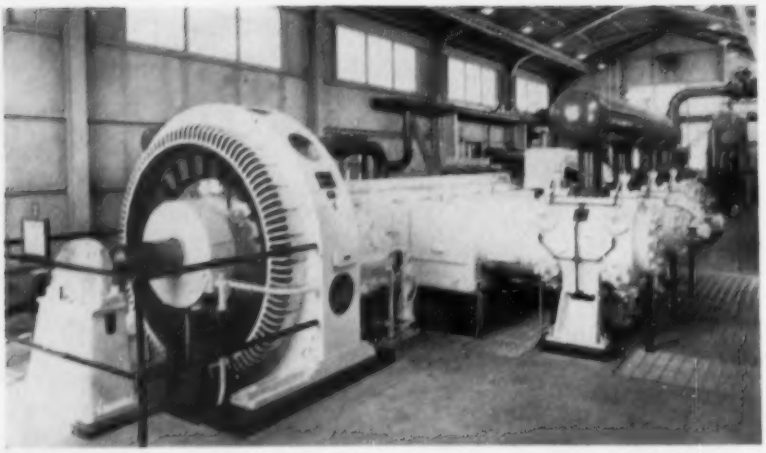
The first trench was completed at the western end of the plot. The trenching machine then was put to work preparing the trench for the most easterly pipe string. By alternating back and forth in this manner, working toward the center of the plot, the machine was able on the third pass to deposit fresh spoil into the first trench, etc. Of course, during the interval in which trench No. 2 was being prepared, a completed string was lowered in trench No. 1 and cushioned in sand. This scheme completely eliminated the costly hauling, stockpiling and replacement of trench spoil. All strings were laid parallel on 7½-ft centers. A trench cross section of at least 42 in. x 42 in. was maintained in order that pipe could be covered on all sides with the required 6 in. of sand.

Welding

All welders employed on the project were initially qualified in accordance with Section IX, ASME Boiler and Pressure Vessel Code. Test rings made from the actual 30-in. holder pipe were furnished for these qualifications. Specifications called for four passes with Class E7010 electrodes with all welding to be downhill. Internal line-up clamps were used in all cases except for attaching the semi-elliptical heads at the extremities. All 30-in. welds and all welds on 10-in. and 6-in. header piping underwent 360° X-ray examination.

Wrapping

Pipe used in the holder was machine-wrapped before being transported to the site. The wrapping procedure included cleaning, application of primer, 3/32-in. coating of Barrett's Waterworks enamel, a layer of Fibreglass, another coating of enamel 1/16 in. thick and a final covering of asbestos felt. Wrapping of the welded joints in the field was accomplished in a similar manner. Completed pipe strings were tested with a holiday detector before being lowered into the trench and again with a Pearson detector upon completion of the backfilling operation.



Interior view of San Diego Gas' enlarged compressor station at Encanto. Installation of new 2000-hp compressor to go along with 1250-hp unit already in use now makes it possible to fill high pressure holders to capacity of 13 MMcf in 8 hours.

Testing

All holder and header piping underwent hydrostatic test at 1.25 times maximum working pressure as prescribed by code. Individual groups were tested in turn after at least 16 hours at test pressure. In order to minimize purging operations, gas was used to force test water from each group after its test was completed into the adjacent group awaiting test.

Cathodic protection

Holder piping is completely isolated electrically from the compressor plant and the adjacent distribution system. A rectifier, anode and ground bed are provided in addition to external test leads at 18 locations throughout the holder system. Several internal coupons, which can be readily removed for inspection and test purposes, are exposed to the gas stream. Since the gas is consistently dry, no trouble from internal corrosion is anticipated.

Inspection

San Diego Gas personnel performed the inspection for all phases of this project. Detailed inspections were made and records compiled during pipe manufacture and wrapping. During the various construction stages the company's inspectors oversaw grading, trenching, welder qualification, welding performance, cathodic protection, field wrapping and backfilling. They maintained a continuous inspection program for visual examination of welds, both inside and outside, and compared findings with X-ray pictures of each weld. They compiled records which provide pertinent data on each length of pipe all the way from the steel mill to the ultimate burial at the holder site.

Holder filling

Gas is compressed by two synchronous motor-driven, two-stage compressors developing a total of 3250 bhp. Gas is taken from an adjacent 16-in. distribution main at a minimum pressure of 100 psig. Compressed gas is cooled to a maximum of 97° F by a series of atmospheric coolers.

Peak compressor efficiency is attained by use of automatic unloading. The 1250-bhp machine employs a pneumatic unloading system, while the 2000-bhp unit is equipped with a system which unloads the compressor according to the electric power consumed by the motor drive.

Holder discharge

Gas is discharged from the holder by way of a common filling-discharge line. Pressure reduction is accomplished in two stages: 925 to 300 psig and 300 to 200 psig. A third stage is included for controlling the rate of feedout. Gas is discharged into an adjacent distribution feeder at an average of 150 psig. A feature which utilizes filling compressors for pumping out of the holder to remove gas remaining at pressures below 150 psig has been incorporated.

Station control system

The automatic control equipment includes provisions for compressor shutdown in the event of low suction pressure, high discharge pressure, low oil pressure, high discharge temperature and, in addition, the equipment for automatic compressor unloading. Plant blowdown is accomplished automatically each time the compressors are stopped either normally or due to operation of any of the safety devices. The control panel provides visual indications of the status of electric supply, compressor loading, auxiliary equipment such as fans, coolers, pumps, and the positioning of major control valves, and includes features for individual testing of auxiliary equipment.

Remote operation

The control equipment includes a supervisory control system which permits complete operation of the plant, including compressor loading and unloading and rate of feedout, from the main dispatching headquarters seven miles away. This system also provides the remote operator with visual indications of compressor operating and loading conditions, valve positioning, an alarm system to signal equipment malfunction and telemetered holder and compressor suction pressure recordings.

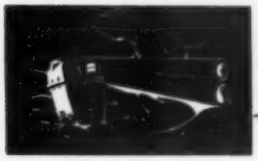
Hydrate prevention

In order to minimize the possibility of natural gas hydrate formation both inside the holder proper and within station piping at points of pressure reduction, a system for injection of methyl alcohol has been installed. A controlled-volume pump automatically discharges the desired amount of alcohol into the gas stream whenever the compressors are pumping. In order to accomplish maximum evaporation and dissipation, the liquid alcohol is introduced into the gas system between the hot compressor discharge and the coolers. Methyl alcohol is added at the rate of approximately 4.5 gal. per MMcf of gas pumped.

Conclusion

Load conditions to date have been such that it has been unnecessary to operate this station on a day-to-day basis. However, sufficient information and experience has been gained during tests and operating conditions of short duration so that San Diego Gas is assured of complete satisfaction with the performance of the plant. ■

This article was adapted from a paper presented at the Pacific Coast Gas Association technical section distribution conference April 10-11, 1956, at Berkeley, Calif.



A. O. Smith Corp. cuts costs of material handling

...How to move water heaters

A "FINGER-LIFT" attachment for fork lift trucks, developed by the A. O. Smith Corp., is credited with saving that company upwards of $100,000 a year in material handling costs at its Permaglas division in Kankakee, Ill.

The finger-lift attachment makes it possible for six men to load and stow from 18 to 22 freight carloads of crated water heaters per 8-hour shift. The heaters are hauled either from the warehouse stock or from the end of the single crating line that serves the mammoth plant.

One industrial fork lift truck operator is now doing the same amount of work in 45 minutes that formerly took five men two hours each to perform. The company credits the application of mechanized materials handling with savings of more than $100,000 annually in labor.

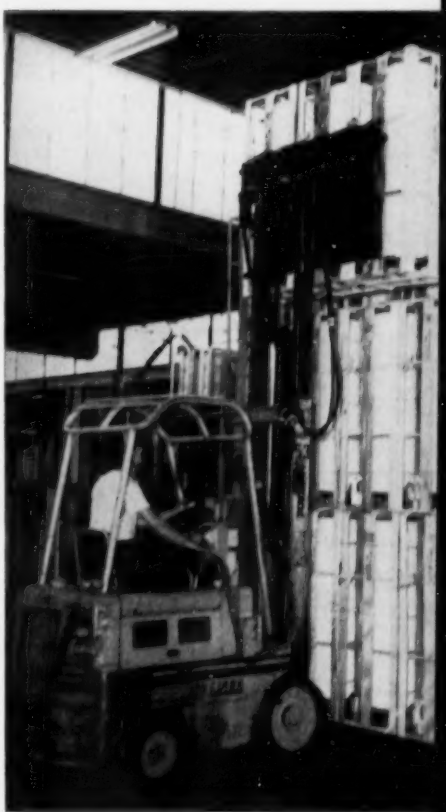
Monthly production at the Kankakee works averages above 40,000 heaters, ranging in size from 6 to 100 gal. Three or four different sizes generally are being crated simultaneously on the single crating line.

Heaters are assembled on the production line on the bases of their shipping containers. A worker at the head of the crating line places the right size crate top on each heater as it emerges from the production line. Other packers then place the blanks around the crate tops and bottoms, close them with wire-loop fasteners and secure them with a few nails, all without stopping a unit as it moves toward warehousing or shipment.

Once the heater has been crated, the fork lift truck with the finger-lift attachment takes over. The attachment consists of spring-loaded fingers mounted on a shaft so that when pressure is exerted on them, they will tilt back individually. Strips of regular saw blades with teeth pointed upwards and backwards are fitted along each side of every finger to allow it to bite into the load during the hoist and prevent slipping. A hydraulically operated side-shifter on each truck fitted with the attachment permits the operator to move the load sideways. The vertical mast of the truck permits high-stacking.

A load of one to three crates is picked up simply by driving the truck against it so that the fingers are on a plane just below the intermediate cleats. The wirebound crates used by A. O. Smith were designed specifically for this type mechanical handling, with the intermediate cleats and binding wires so placed that the finger-lift trucks can move in quickly and easily for a hoist. The fingers on the lift attachment are raised on the mast so their saw teeth bite into the wood of the cleats and lift the crates clear. The load then is carried either to storage, where the same truck high-stacks them, or direct to cars or trucks, where they are loaded by the same truck without additional help.

Formerly, two men loaded crated heaters onto pallets at the end of the conveyor. A fork lift truck transported them to the car or truck, and two more men were assigned to load them into position. The five men required two working hours each to load a freight car. Now, one man operating the industrial truck with the finger-lift attachment does the same job in 45 minutes. ■



Three crated water heaters are quickly transported from crating line and stored in warehouse of A. O. Smith Corp. at Kankakee, Ill., by industrial truck equipped with "finger-lift" attachment. Finger-lift attachment replaces conventional forks.

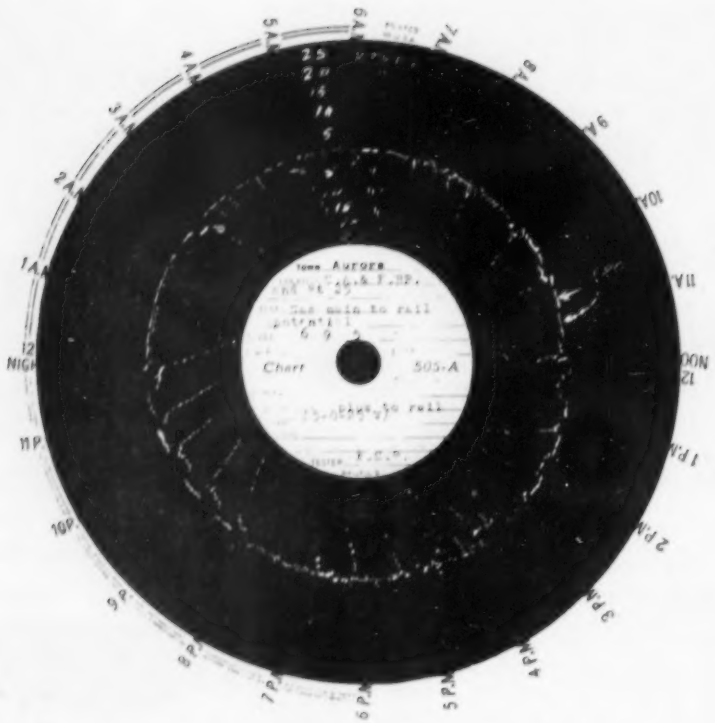


Fig. 1. Chart made without protective device.

Meter helps combat stray current

Fig. 2. Chart of same location made with protective device.

STRAY current from direct electric current railways, surface lines and subways provides gas distribution companies with probably the oldest form of cathodic protection known, and, conversely, causes some of the most potent losses when control is inadequate or improper.

It is likely that 99% of the people concerned with underground structures in the many stray current areas have made a valiant effort to control the effect of these corrosive currents. In many cases they have done the job with fair success, but frequently an even more effective job can be accomplished.

This statement is projected from the thought that more accurate data need be and can be secured in stray current areas. These currents can be controlled by proper drainage through the use of well-designed, properly selected and installed reverse current equipment at the points where stray current makes contact with the structure.

Four electric railways run through the territory of the Northern Illinois Gas Co. Its corrosion department has been well aware of the necessity of proper control in these areas and has made a substantial number of installations to offset the stray current effect. But it became aware of the fact that the data secured were not fine enough to justify expenditures in some areas. It became necessary to devote extra effort to obtain more accurate voltage measurements to secure the proper data.

In making electrical ties for drainage control of stray current, a survey of potentials between the structure to be relieved and the running rail of the railway or the negative of the supplying substations is always necessary. Northern Illinois had previously made such surveys in the usual manner by using recording meters of the 24-hr smoked-chart type. In this manner, the

By ELMER C. PAVER, Engineer
Northern Illinois Gas Co.
Bellwood, Ill.

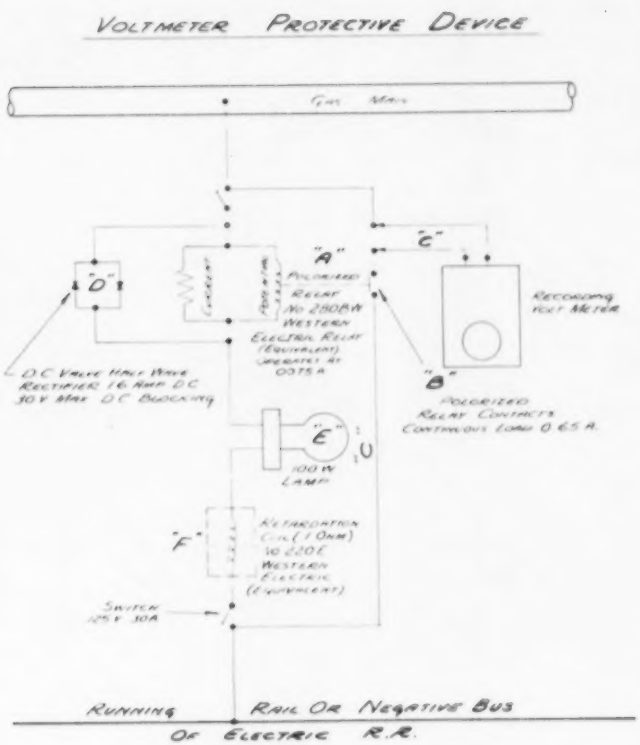

VOLTMETER PROTECTIVE DEVICE
GAS MAIN
"A"
POLARIZED RELAY No. 250BA WESTERN ELECTRIC RELAY (EQUIVALENT) OPERATES AT 0.075 A
"C"
RECORDING VOLT METER
"D"
D.C. VALVE HALF WAVE RECTIFIER 16 AMP. D.C. 30 V. MAX. D.C. BLOCKING
"B"
POLARIZED RELAY CONTACTS CONTINUOUS LOAD 0.65 A.
"E"
100 W LAMP
"F"
RETARDATION COIL (1 OHM) 10 220 E WESTERN ELECTRIC (EQUIVALENT)
SWITCH 125 V 30 A
RUNNING RAIL OR NEGATIVE BUS OF ELECTRIC R.R.

Fig. 3. Schematic drawing of voltmeter protective device.

voltmeter had to be set on high enough scale to take care of the high reversals, which gave a very poor chart for the forward, or structure to rail or negative, potential. For example, by checking with an indicating meter, the voltage at the time of passage of an electric train at the check point, which is usually the highest, is found to be 20 v, so the recorder is set on a 25-v scale. This means that, in a division of 25 on the chart, each division is 1 v. Any forward voltage of 1 to 3 v is very small, and barely shows on the chart. It is even less discernible on higher scales.

Northern Illinois, with numerous crossings of the railway systems with its distribution and supply lines, knew that to do an accurate and adequate job of stray current mitigation, more accurate potentials had to be obtained. A steady or intermittent 1- or 2-v potential from structure to rail can soon cause a failure, even with coated pipe.

To help combat this problem caused by stray current, Northern Illinois made an instrument they call a voltmeter protective device.

The device (see *Fig. 3*), which is the "brains" of a reverse current switch, is built around a polarized relay "A," which is adjusted to have the contacts "B," of the recording voltmeter circuit "C" closed on zero or above forward voltage. When reverse voltage occurs, the relay will open the contacts in the recording voltmeter circuit, thereby protecting the meter from higher voltage than it is set for. The relay is protected from abnormal voltages, occurring occasionally on electric railroads, by the rectifier plates "D," lamp "E" and retardation coil "F."

For example, with a voltage recorder set on a 25-v scale, the low readings for the forward potentials are hardly shown; however, with the ability of the protective device to cut out the high reversal voltages, the recorder can be set on a 5-v scale, and very accurate readings can be obtained, even down to one-tenth of a volt. It is naturally assumed that the scale set is obtained by observing potentials previous to setting the recorder, or by getting a 24-hr chart previously without the device.

Northern Illinois Gas Co. has made very good use of this device at numerous locations throughout its distribution territory. The data secured have enabled the corrosion department to select the proper locations and proper and most economical type of drainage ties and equipment. No doubt other methods of drainage data may be evaluated such as direct ties on a temporary basis, but expensive cable connections to rail and pipe can usually be forestalled by more accurate data.

Fig. 1 is a chart made without the protective device, while *Fig. 2* shows the same condition at the same location at the same time with the voltmeter protective device in the circuit of the meter. It can be seen that better evaluation of conditions was obtained from *Fig. 2*, and that better judgment can be used in designing and installing proper drainage. Following a temporary installation tie of gas main to rail to determine the current drain, a properly designed reverse current switch installation was made.

Location of the voltage survey from structure to rail should be checked and approved by the railway so that any accidental short or equipment breakdown will not upset the automatic signal system. ■

Elmer Paver, Northern Illinois Gas Co. engineer, inspects voltmeter protective device he designed for stray current measurement.

The electric heat pump used in combination cooling-heating systems is nothing new. It's the same pump that is used in the kitchen refrigerator, and it is expensive to operate. Good promotion has helped these electric appliances gain in popularity. Now, it's time the gas industry started supporting and promoting gas cooling-heating installations.

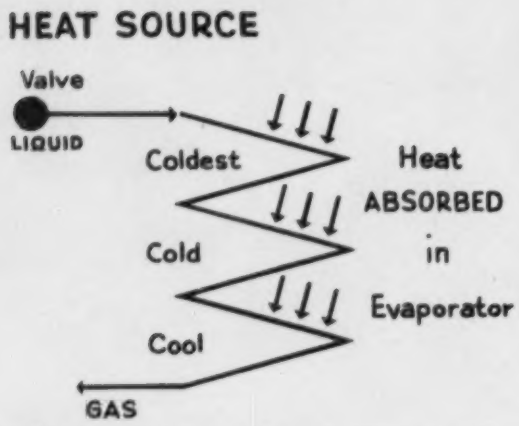


Fig. 1. Diagram of the freezing compartment of electric refrigerator or air cooler.

Let's look at the heat pump

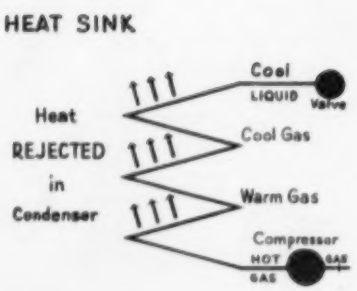
By THOMAS LEE ROBEY, Coordinator of Research

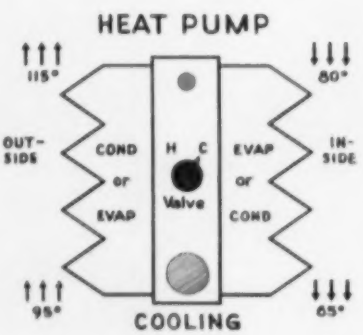
American Gas Association, New York

IN VIEW of all the fuss and feathers about the electric heat pump these remarks will be directed toward developing prospective—so let's look at the heat pump. The heat pump is not magic in spite of what you may have read. It is not magic at all since all of you have one in your home and have had for years—the domestic refrigerator. It pumps heat out of the freezing compartment and dumps it in your kitchen. As a matter of fact, almost any refrigerating device can operate as a heat pump.

The heat pump is not new—it was and is an interesting discussion topic for every college physics class. It was first suggested more than 100 years ago by Lord Kelvin, who proposed that refrigeration could be operated in reverse to produce heating.

Since then refrigeration and heat exchange techniques have greatly improved and although large buildings have been "pump heated" for years, it is only recently that domestic units have become available—some 2000 of them, not counting the small reverse cycle window units, are in service.





How does the heat pump work? Let's start at the beginning:

Heat always runs down hill—from *any* hotter high temperature to *any* colder low temperature *region*. We can and do take advantage of this natural law; it is the basis of our industry. Now if sides are put about a region, then the heat can be contained and channeled for some useful purpose. A house heater, for example. Thus, heat from the high temperature gas flames flows into the low temperature air at say 30° outside, until it becomes 72° inside.

If the container is now insulated, closed and filled with liquid air—minus 200° or so—and if icicles—32°—are substituted for the flames, heat will

Fig. 2 (above left). Diagram shows how compressor accepts Freon gas and raises its pressure, further heating it.

Fig. 3 (bottom left). Diagram of heat pump set for cooling.

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The heat pump... Expensive strip heaters are used to maintain comfort conditions

again flow into the container.

The point is that the location of the heat level is not controlling, it is essential only that there be a temperature difference so that the heat will flow into the desired region. This is the basic principle of the heat pump—its ability to absorb heat at low temperature.

Now look at *Fig. 1.* This shows the freezing compartment of a refrigerator or an air cooler. Liquid freon, for example, enters through an expansion valve, absorbs heat and in gaseous form leaves the freezing compartment. Since heat was absorbed—flowed in—this is the heat source and the operation occurred in the evaporator.

Balance of operation

Fig. 2 shows the remainder of the operation. Here a compressor accepts the freon gas and raises its pressure, further heating it. In order to return to the liquid state heat must be rejected—heat flows out—and this is done in the condenser, or heat sink.

So much for the background. Now let's put the units together in a heat pump. *Fig. 3* shows a heat pump or any air cooling compressor unit set for cooling.

The discs represent the expansion valve and the compressor. The evaporator inside is absorbing heat or cooling air from 80° to 65°. This is the circulated air temperature, not the room air temperature. The condenser outside is rejecting the absorbed plus compression heat so that the air over the coils is increased from 95° to 115°.

Note that by turning the center valve from cooling to heating, the evaporator can become the condenser and the condenser will then become the evaporator and the cycle will be reversed for *heating* inside and *cooling* outside.

This is shown in *Fig. 4.* We now have a heat pump heating. Note that the source of heat is outside air at 30°. The evaporator is colder and heat flows into it from the outside air. The condenser is now inside and is rejecting or releasing the absorbed plus compressor heat to warm the house. Again the 85° temperature is for the circulated air. Note also that when the outside air is colder less heat is absorbed and less is delivered to the house. That is, only 3° now.

It can be said that any heat pump in heating and cooling suffers one abiding drawback. It is always less efficient when it is most needed. Thus, when most cooling is needed, it must reject heat against the highest air temperature; when heating is needed most, it must absorb heat from the lowest air temperature.

Electric answer

Under low outside temperatures, *Fig. 5* shows the electric answer. Since not enough heat can be absorbed from the outside air, strip heaters, the most expensive kind of heating, are used to maintain comfort conditions.

On the other hand, a gas fueled heat pump, shown in *Fig. 6,* does not need strip heaters since in producing refrigeration, heat is available which can be recovered and used to maintain comfort conditions—40% of the input. This is an advantage in the heating cycle but a complication in the cooling season.

The heat pump must be designed primarily for cooling—for absorbing heat. That is, heating can only be 150 to 200% of cooling load. Thus, its heating use in the North would require cooling capacity well beyond economically feasible sizes. The balance point is about 20° to 30° outside temperature, as shown on *Fig. 7.* After this, strip or other supplementary heating comes on. The heat pump is only really feasible in the Southeastern part of the country.

As to cost, I have no figures yet on a gas heat pump. The electric heat pump, without promotional subsidy and for the air-to-air 5-ton unit installed, costs the customer about $3400, according to

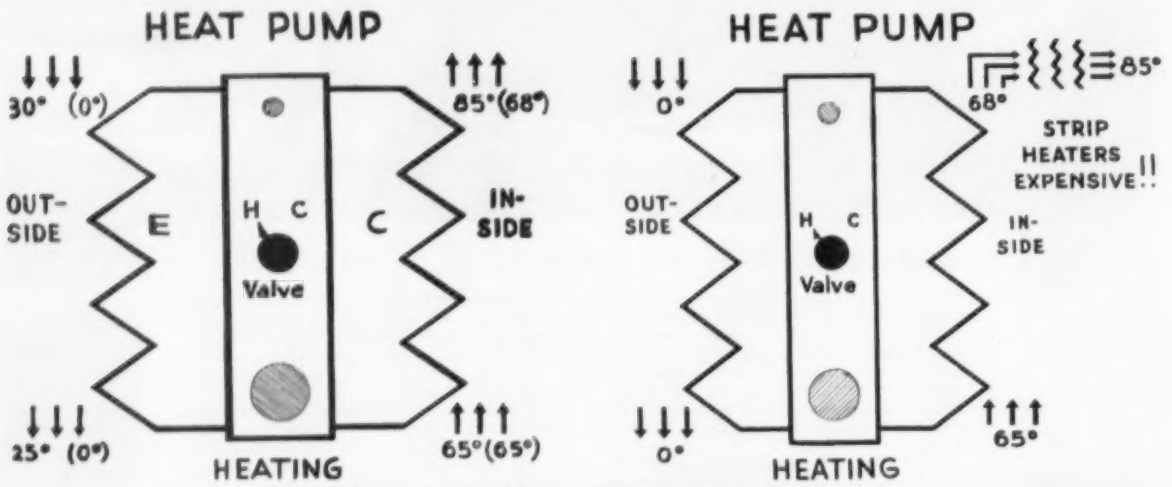

Fig. 4 (left). Diagram of heat pump heating. Fig. 5 (right) Diagram showing reaction of electric heat pump to low outside temperature. Strip heaters, expensive to operate, must be used to maintain comfort.

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Your most powerful gas range selling feature of all time is now ready: the HARDWICK Thermal Eye top burner control. Set the HARDWICK Thermal Eye control dial for the desired temperature; the Thermal Eye element presses against the bottom of the utensil, constantly checking its temperature and controlling the flame to keep food cooking at the exact temperature selected. Makes every pot and pan automatic!

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Hardwick Gas Ranges

Since 1879

The heat pump... It is difficult to pin down costs in view of varying rates and efficiency

H. M. Brundage of General Electric—maybe less now. He also indicates a reduction to $2150 by *1958*—this in expectation of sales annually of about 30,000 units! It is also interesting to note that he indicates the cost of side-by-side combustion-heater, and electric-cooler units at $200 less even then!

It is difficult to pin down operating costs in view of varying electric and gas rates and varying efficiency. Generally at an efficiency of three, a natural gas heating rate of $1 is about equivalent to 1.3 cents electricity. Overall, it may be said that an electricity cost of 1.5 cents or less is indicated as competitive.

Motivation

In view of the foregoing, why is the electric heat pump so strongly pushed? Why are electric appliance manufacturers shouting about the heat pump? The answer is quite simple in my opinion—it is the only way that kilowatts can hope to compete with gas Btu's for the heating load—it isn't even a good way (technically speaking), it is merely the only way.

But be realistic, technical qualification has little influence—the potential for the electric industry was stated by Phillip Sporn (American Gas & Electric Corp.) last year: "It would practically assure an all-electric residence, one with 20,000-32,000-kwhr use instead of the 2600-kwhr present average." Also, P. F. O'Neill, GE heat pump department, in 1954 said, "The installation of a heat pump system in the home should act as a magnet attracting only electric appliances. There is no reason for other service facilities such as gas and oil."

Vast amounts of money are being spent on cleverly written advertisements, popular magazine articles and promotional programs—all pointed at developing the desire for "really modern inexpensive" heating and cooling. One quickly gets the idea that heat from the air is free—that humidity is completely controlled, that the house can be sealed, that there is no maintenance—and so on!

Plentiful advertising dollars are fostering these impressions and in spite of the facts, electric heat pumps will be improved and will be sold in increasing numbers even in the North—please don't underestimate this situation—it is very real.

Now what can the gas industry do? First, look to your research, both PAR and by the individual manufacturer. Meanwhile see to it that entirely factual articles appear both in technical and popular magazines, and very important, that industry heating advertisements punch out the economy, the cleanliness, the convenience and the ventilation characteristics of good gas heating.

PAR projects

What of research? The PAR work has under way 13 projects, five on processes or drives, six on improvement or basic information and two critically reviewing the potentialities of the gas heat pump. Four individual manufacturers in addition to Servel are working all out on air conditioning. Some $1 million will be spent on gas air conditioning research and development in 1956.

Compare this year with only three years ago when Servel was practically alone in the field; beside Servel there are four engine units available in limited numbers, and before December you should see two, perhaps three, additional air conditioning units in prototype form. This is indeed a considerable advance.

In closing let me urge:

. . . Don't be panicked by the electric heat pump, but

. . . Don't sell them short.

. . .Do support gas heating and gas cooling in every way—sales, service, promotion, advertising and research ■

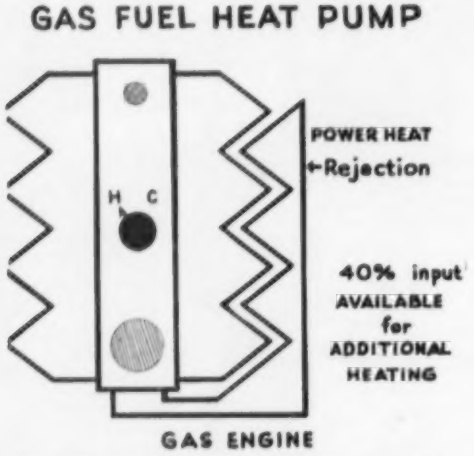

Fig. 6. Gas-fueled heat pump, shown here, does not require strip heating under low outside temperatures.

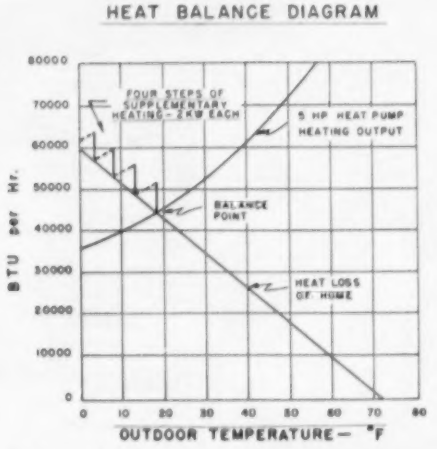

Fig. 7. This is a heat balance diagram for an electric heat pump. Note balance point—20-30° F. outside temperature.

This article is adapted from a talk presented at the NEGA convention in Boston on March 22-23.

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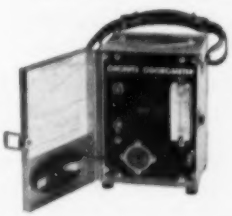

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Built-in kitchens are great—

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Subdividers are turning to built-in kitchens as an added sales feature. They can be the answer to the housewife's prayer — or they can become first-class booby traps. Some first-class planning is required to make the built-in kitchen the efficient working area it should be. The main think to remember — give the housewife some working space. Two feet of counter area isn't enough.

By MARY E. HUCK, General Home Service Director
Ohio Fuel Gas Co., Columbus, Ohio

THE popularity of built-ins in modern kitchens is easy enough to understand. It is a logical development from the trend toward ranch style or open plan living. Built-ins definitely give a streamlined look since the appliances blend in with cabinets and walls. The kitchen, often in partial view of other living areas, needs to take on a dressed-up, non-utilitarian look.

Another definite trend is that of making the kitchen a family centered room. More and more, young husbands share in "housekeeping chores" since wives help with the bread winning. The kitchen ceases to be a woman's domain and is instead the place where the entire family can work together.

For some reason we associate the built-in look as the modern look and this, more than anything else, is the reason builders are including sectional equipment. They are finding that it sells houses. Also, built-in appliances can be financed as part of the house, which is especially important since equipment has become a major item in the household budget.

Most women have the mistaken belief that built-in equipment means a convenient and efficient kitchen, and have accepted it in new homes without any complaints or suggestions for improvement. Perhaps part of this goes back to the fact that for years many women have thought that cupboards built around the walls was the latest in modern kitchen planning. In the rush to use built-ins, builders have put them in without regard to the proper placement in relation to the various work centers in the kitchen. I was interested in reading that in a recent survey by *McCall's*, an analysis of 50 kitchens using built-in ranges and refrigerators showed a definite decline in step-saving and convenient relationships between work centers.

In considering built-in equipment, we must remember that it requires a different size and shape kitchen than conventional appliances. If we are to keep Mrs. Customer happy with her new built-in gas range, we must be sure that it doesn't mean extra work for her. All of us in the gas industry should accept the fact that many of the small cracker-box type kitchens will not accommodate built-ins.

I remember one kitchen which was presented to our kitchen planning consultant. It was a nice square little kichen with cabinets running all the way

around both the wall and the base areas. Right next to the door was a built-in oven, next to that was the top burners. Then came the sink, about 24 in. of counter space and the refrigerator. The builder, and, I am sorry to say, some of our men were thrilled at this modern kitchen they were offering the homemakers of Ohio. What they were selling her was 24 in. of counter space on which she was expected to roll pie crusts, mash the potatoes, stack the dirty dishes, open the beer, fix the baby's formula, clean the vegetables and mix cakes. In that size kitchen a good apartment range would have been much better for the woman who was using it. She would still have her four top burners, a good baking oven and a broiler plus additional counter space. Actually, sufficient counter space is just as important as having the appliances at a convenient level.

One of the trends which worries me is the thinking that all built-ins need to be placed at a convenient eye level position. Sooner or later we must accept the fact that in any one kitchen there is only a given amount of waist-high counter space. Built-in equipment definitely requires more. If we are to have it, then kitchens must be planned bigger and better. Everyone wants this premium space. We like it for the oven, the top burners have to be there, refrigerators are trying to sneak into this area, and now a dishwasher manufacturer has come out with a waist-high model for easy loading. This brings me back again to my question, "Where are you going to roll out the pie crust?"

We want to bring things down from the ceiling so the homemaker doesn't have to reach. We are also trying to bring things up from the floor so she doesn't have to stoop. As we reduce the height of wall cabinets and appliances and the more we bring base cabinets and appliances up from the floor, since the required cubical contents remain the same, more floor area is required. More floor area—the larger the room. The larger the kitchen the greater the distance to walk. If we increase the size of the kitchen, the dimensions of the house must be correspondingly increased and then, of course, the lot. All of this adds up to increased cost.

So, does the homemaker prefer to reach and stoop or does she prefer to walk a few extra steps and is the increased cost justified? If all women observed very carefully the basic rules of time and motion, each step would accomplish its purpose and space might not be so important. Remember, though, it's hard to develop factory efficiency standards when there are tricycles under foot and babies cyring.

Properly planned built-in top burners can be most efficient in a larger kitchen. Since they are so adaptable to island and peninsula installations, they can be placed so as to greatly reduce the number of steps between working areas.

Cleaning is simplified with all built-ins since there are no cracks between appliances and cabinets. Separates give you just wide enough space to drop things in and yet not enough space for a good sweeping. Then too, you don't have as much side and top areas to wash with built-ins.

One of the advantages of built-ins in a properly planned kitchen is more storage space under the oven and top burners. The space above the oven, however, is not too usable and can be suggested only for some of the less used items in the kitchen.

Another advantage is that built-ins can be installed at a height convenient to the individual homemaker. Yet most built-in equipment is installed by builders. Homes are being bought these days, not built. So, it is not the individual customer who plans the house. Many builders have reached an accepted height for ovens, yet there are few standard women. Perhaps you are thinking, "Well, what difference does an inch or two make? Isn't it still easier for women to have ovens at an eye level rather than bending to take out cakes?" It is hard to lift a heavy roast when you need to reach up for it. Also, there is more danger of burns when oven doors are too high. If we must standardize oven placement then I hope we err on the side of getting them too low.

One of the greatest advantages of the built-ins is the flexibility which separate units provide. Range burners do not need to be installed side by side; ovens do not have to be adjacent to top burners. Actually, to place them next to the top burners defeats the purpose of built-in equipment, yet how often it is done. Ideally, the oven should be located in an area where heat won't matter too much. There is no reason why the oven needs to be in the main working area, since it is not used as often as the range top.

Care should be taken, however, to avoid isolating the oven, as is so often done, with no adjacent counter space. What do you want a woman to do with a hot casserole or roast when she lifts it from the oven? Remember, there are no top burners to set it on. Avoid placing the oven in the middle of a counter area or between two work centers, such as the refrigerator and the sink. If this happens, you create blocked-in areas that will give you claustrophobia, keep out the light and completely hem-in the flow of traffic.

Another problem which confronts us is color. If built-in appliances are to give the appearance of blending in, then the color or finish must be such that it can be coordinated with the cabinets. The trend thus far has been primarily toward a natural metal finish, although many manufacturers now offer a selection of colors. I wish I knew the answer to those of you who are respon-

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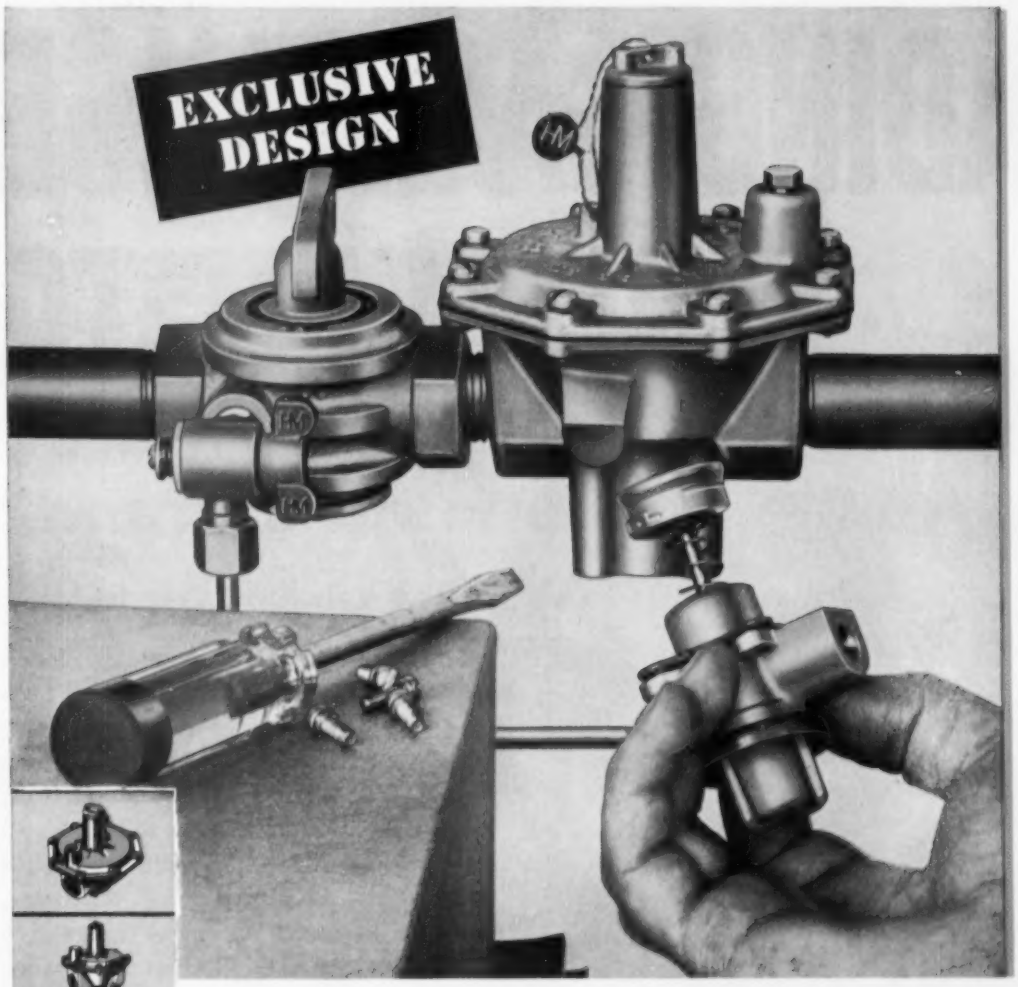

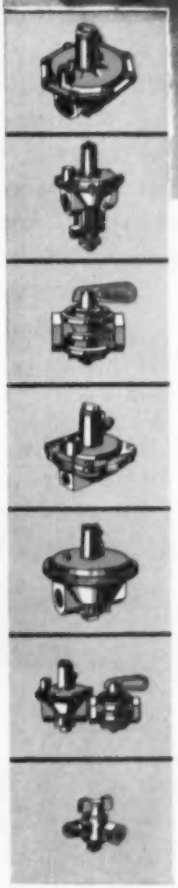

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Built-in kitchens... With the built-in trend, more appliances are going into the kitchen

sible for deciding what will be offered. Although the colors don't need to match exactly, they must come reasonably close. For the most part, I believe that women are more sensitive to color than men and will detect differences in shades. Also, because they are accustomed to shopping around until they find the purse that will match the shoes, the wallpaper that will match the rug or the draperies that will match the davenport, they will not be adverse to looking at two or three ranges to make sure that they get what they want. You will find, too, that most women lean toward the more pastel shades. If you are deciding to add a pink range to your line, make sure that it's a soft pink rather than a deep rose. I am sure that most of you who are thinking about color will undoubtedly consult with some women before you make definite decisions.

I am probably sticking my neck out on my next suggestion because I realize some of the problems are almost insurmountable. But isn't there some way we can arrive at a certain amount of standardization in sizes of built-ins? Perhaps it need not be in the size of the unit itself. Could the bezel around the oven be such so as to make several ovens usable in the same cabinet? This surely would make it easier for builders to plan kitchens. It would also mean that women might not have quite the fear of future changes. I wish, too, that there could be some simplification of the specification sheets. This, I know, would take some coordination with cabinet manufacturers, but I should think it would be to everyone's advantage. Couldn't it be listed on the spec. sheet that this oven will fit in Mutschler Cabinet, C 123; Republic Steel Cabinet, B 345; St. Charles Cabinet, A 14. Most women have a hard time deciding if an oven which is 20-3/16 in. wide with a trim 1-5/32 in. will fit in a cabinet that has an opening of 20-1/4 in. And just think how much easier it would be for the "do-it-yourself" fans.

Some manufacturers are now considering cabinets to supplement their equipment. These units are fine but should be planned from an efficiency standpoint. Don't just place the oven or the top burners in a wooden cabinet and then feel that this is the answer to the built-in problem. An oven with four burners adjacent in a unit is no more advantage to the homemaker than the old high-oven range. All she is getting is her equipment in a wooden box instead of in a porcelain enamel finish. Please think of the two units as completely separate and plan the storage and cabinet space accordingly.

With the built-in trend there are more appliances going into the kitchen area. Laundry equipment in the kitchen is becoming more and more acceptable, as is the water heater. As these appliances become part of the kitchen we must give more consideration to adequate insulation, proper venting and good ventilation.

But so much for built-ins as they apply to the whole problem of kitchen planning. Once you get in the built-in business, you can't divorce appliances from complete kitchen planning.

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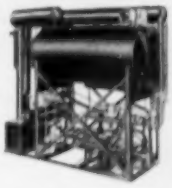

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Built-in kitchens... Is there any way that pilot controls can be made more accessible?

the moment is the range. It started the trend, as far as gas appliances is concerned, and is still the leader in the field. Our customers can assume that the performance of built-ins will be the same as the performance of separate ranges. A good built-in gas oven will turn out as good a cake as a separate. There are, however, a few features that are peculiar to the built-in oven which, simply because of the nature of the beast, require special consideration.

The first is the importance of good insulation. There must be sufficient insulation to prevent charring or staining. Remember, you do not have the wide air pocket between the oven and the cabinet that you have in a free-standing range. With a free-standing range, if a cabinet is marred it is fairly simple to pull out the range and paint the damaged section. This becomes more of a problem with built-ins. For the same reason, accurate burner adjustment is essential.

Never before has it been so important that we have a tight oven door seal or a cool oven door. In a free-standing range any heat leakage around the oven door isn't too noticeable, since it usually hits the homemaker in an area protected by clothing. With the oven at face level even the smallest amount of heat can be uncomfortable. Remember, too, that in a conventional range the oven vent is at the back so the heat dissipates before it reaches the user. With the built-in oven the heat from the vent comes right smack out in your face. Either we should redesign the oven vent or, whenever feasible, provide outside venting.

With the low Btu pilots there shouldn't be too much trouble from heat caused by pilots, although again it is more noticeable because it comes out directly in your face. Manufacturers are giving us pilots of low input for cooler kitchens. I hope service departments are adjusting them so they will actually be that way in a customer's home.

Speaking of pilots, is there any way at all that pilot controls can be more accessible? Some of the home economists I have talked to feel that it is even more difficult to light an oven pilot on a built-in than it is on a conventional range. I personally don't think it is any harder—it couldn't be.

Some home economists have been quite concerned about dropdown oven doors at waist-high level. They feel that they are more likely to cause burns and make cleaning more difficult, particularly for the shorter homemaker. Perhaps this is something that needs some additional study by the gas industry. I can remember a gas range we once had that had a side opening door. It does make cleaning simpler since the reach isn't quite so far.

The first reaction that many women have to a built-in oven is that it looks too small. For some reason, built-ins tend to look smaller than ovens of the same size on a separate appliance. My only suggestion would be to consider using a light enamel since this has the tendency to make the oven look big-

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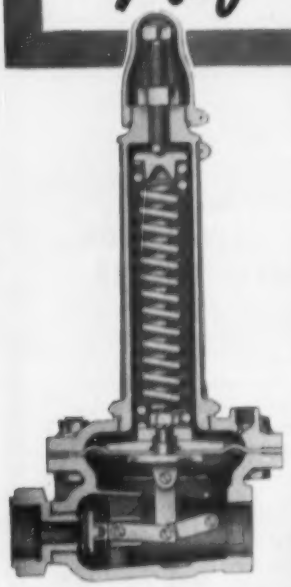

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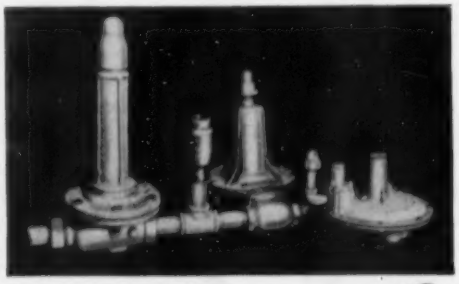

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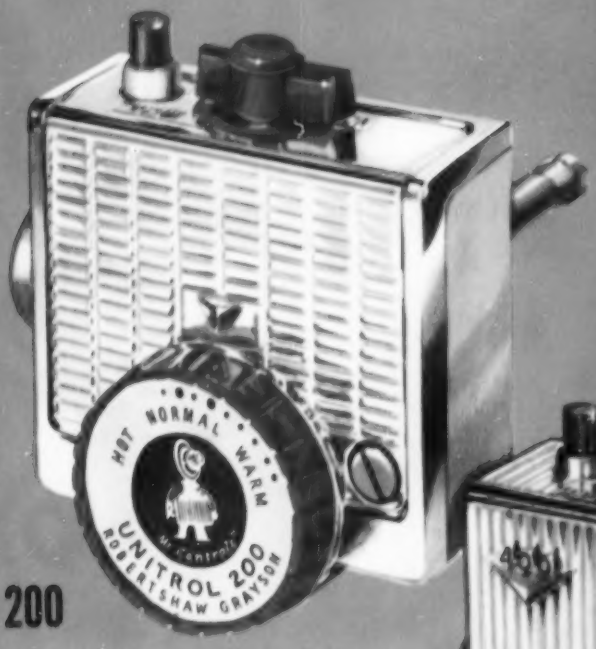

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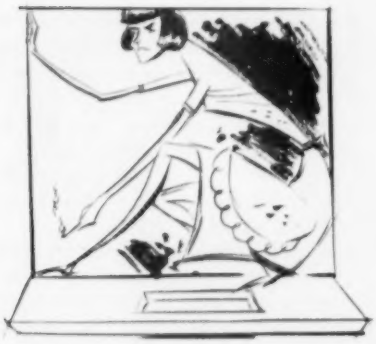

ger. And are we sure that our built-in ovens are as big as we want them. The woman who buys one today will have to live with it and like it for years to come. Didn't some of you find the big ovens in free-standing ranges quite popular?

Waist-high broilers

For years now, we have promoted the use of waist-high broilers, deep enough to do all types of broiling. There are still many women who like that feature of the separate gas range, particularly when the burner is equipped with some type of radiants. Other women like the advantage of being able to bake and broil at the same time using a high temperature for broiling. With built-ins, we are now asking them to take a step backwards—use a shallow broiler and give up their oven space when they want to broil. With all the promotion on rotisseries, we have a limited selection for the woman who wants this feature in a built-in. Just recently I have noticed ads for some double built-ins. But there I go again, asking for more space after trying to point out that in most kitchens there just "ain't enough" anyway.

The advantages of gas are as evident in built-in top burners as they've always been in free-standing ranges. Built-in burners are more flexible in that they can be grouped as desired. They shouldn't be too close together and they should be next to a heat-proof counter. In some installations it seems that counter space is lost because the front burner is so far from the front of the counter. Is there any way this distance can be reduced? It's especially important for island installations.

The builders' market is highly competitive, I know, but let's not get construction so cheap that flash tubes are easily bent in installation and burner bowls are too shallow to catch spillovers. And don't, in your haste to make them easy for a builder to install, forget that Mrs. Homemaker needs storage space. Bringing the plumbing down in a back corner gives much better storage as does keeping the burner box no deeper than necessary.

Burner bowls

Now that we, and the electric industry, have convinced women that burners in individual burner bowls are more modern and attractive than clusters, why can't we offer them in built-ins? I'd also like to see more built-in griddles with thermostatically controlled burners.

The trend toward pull-down units seems to be still in the trying-out stage. If a woman used them properly, she could increase counter space considerably by having down only the units in actual use. I can visualize, however, than many women would find them unhandy because they would usually have the sack of flour or a can of baking powder in front of the burner they

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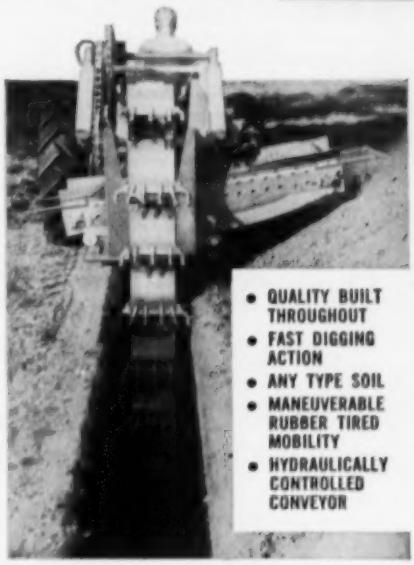

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Built-in kitchens... Built-in refrigerators are rapidly moving to the front

wanted to use at that time.

Although our first thought of built-ins is of ranges, it wouldn't take a crystal ball gazer to see than built-in refrigerators are rapidly moving to the front. So far, the built-in refrigerator has been confined primarily to the electric industry. However, with the bezel, which is available for the Servel gas refrigerator, we can offer just as modern a built-in.

Some of the built-in refrigerators are shown in a horizontal position with all of the shelves at the no-stoop, no-stretch level. The problem with these is that they are about 5 ft long and require a fairly big kitchen. Also, they require heavy wall construction. Installed by a builder, they will not be convenient for every homemaker. In a refrigerator, it is especially important to reach the top shelf easily. Many of use have cupboards where the top shelf is accessible only by means of a chair or, in the case of an extra efficient homemaker, by a step stool. Although I don't mind standing on a chair to reach the special plates I use for company, I don't particularly like the idea of climbing to get a bottle of milk or a couple of eggs. If you get the horizontal refrigerator down so the top shelf will be easily reached by a short woman, then the counter space below it is quite low. This type refrigerator should definitely be planned to fit the individual customer.

In some of the built-in vertical refrigerators, you have separate units for freezing and for food storage. This is fine, because you don't have to open up the freezer every time you want a head of lettuce. One of the faults of many models now on the market is that the ordinary refrigerator space is not large enough to accommodate the needs of an average family. For the most part, the freezer section and the normal cold section are the same size and most families, particularly if they are storing milk for children, need more normal cold space. Of course, they can always install a second unit. If we should have a gas built-in, I should like to see us provide ample space.

It would seem to me that in the future, we might want built-in freezing and ice-maker sections in one part of the kitchen and the normal cold area in another. Actually, there is no reason why, from a use standpoint, the two

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Built-in kitchens... Laundry equipment is just making its debut in the built-in field

have to be together. From an operation standpoint, however, I can see the efficiency of having the two combined. If so, could the freezing area be placed down below and the more often used section at a higher level? But then we'd need an easier method of defrosting than scraping off the ice. There has been some thinking in terms of having some refrigerated drawer space so the pull-out base shelves could be used more effectively.

We are just finishing the installation of a built-in Servel in one of our new kitchens this week, so I don't have much practical experience to go on. In this installation, the air is vented into an area outside the kitchen. It would seem to me that this could be a definite advantage over the free-standing model.

Some of the electric built-ins have compressors which can be placed in the basement or an adjoining room so they will not take up space and create noise in the kitchen. This sounds like a good idea and perhaps should be given more consideration in our field. Maybe a built-in would make it practical.

Color in buit-in refrigerators may not be the problem it is in ovens. Because the finish is not exposed to high temperature, a local spray job is many times the answer.

Laundry equipment is just making its debut in the built-in field and again we are probably safe to assume it's here to stay. So far, I believe that most units are electric. One manufacturer has just come out with a built-in combination washer and dryer. Washer and dryer with Formica tops seem to be another step toward the "blend-in" look.

Twin built-in

The problem of designing a good looking twin built-in might be somewhat difficult since washers quite often are top loading and the dryer is always front loading. With the terrific acceptance of dryers, I can't see the installation of a built-in washer without the mate by its side. Washers are probably one of the most automatic appliances in use today and as a result many times require more service than other equipment. In built-ins, controls should be easily accessible.

Even though dryers are the last word in automation, fabrics are not. Drying is still an activity where fabrics need to be checked occasionally and taken out when done so that wrinkles don't set. Because of this, women are insisting that laundry appliances be on the living level. For this reason, the built-in look will be important. Another building trend which is evident is that of putting the washer and dryer in the bedroom or bathroom area. Since much of the laundry comes from this part of the house, it is not at all illogical to have such an arrangement. In such cases, built-ins would be most adaptable particularly if linen storage could be designed overhead. In the past, washers and dryers installed in this area are enclosed behind cupboard doors as a substitute for built-ins. It has been

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reasonably practical, since the laundry equipment is not used as often as kitchen equipment. When laundry equipment is installed in either the kitchen, family room or other upstairs area, it is most important that it be adequately vented. This holds true whether it be built in or separate equipment.

The water heater, too, is currently moving out of the basement and into an area adjacent to the laundry. As yet, I have seen no built-ins, although with the current trend toward installing them behind louvered doors or bamboo curtains it would be logical to assume than a built-in water heater is not too far in the future. Of course, we have had some table-top models which very easily could be incorporated into a built-in cabinet. Many of these, however, are limited in size. To use a higher Btu burner would involve additional problems of insulation.

Water heaters, as you well know, are subject to many more hazards than other appliances — liming, electrolysis and rust. A built-in unit would need to be designed so the heater could be easily removed for replacement. Again, if it is to be built-in as part of the kitchen or laundry, insulation and heat control are terribly important and venting is absolutely necessary.

Incinerator possibilities

The other gas appliance which should be given careful consideration as a built-in is the incinerator. To be truly competitive with other types of barbage disposers, it should be possible to install the incinerator in the kitchen. I know there are many problems that will come up from such an installation but we must remember that as far as garbage is concerned, we are competing with a piece of equipment where the homemaker doesn't have to move an inch. Naturally, if the incinerator is designed as a built-in it must be attractive in appearance, safe, completely odor-free, fully insulated and vented unobtrusively. Ideally, it should be installed right under or near the kitchen sink. If it's completely automatic and needs only to handle trash as it accumulates, couldn't it be designed much smaller? Built-in, it wouldn't need to hold a bushel.

Regardless of the popularity of built-ins there are still some advantages to separate gas appliances. Until built-ins meet these advantages, some women will still prefer separates. The biggest

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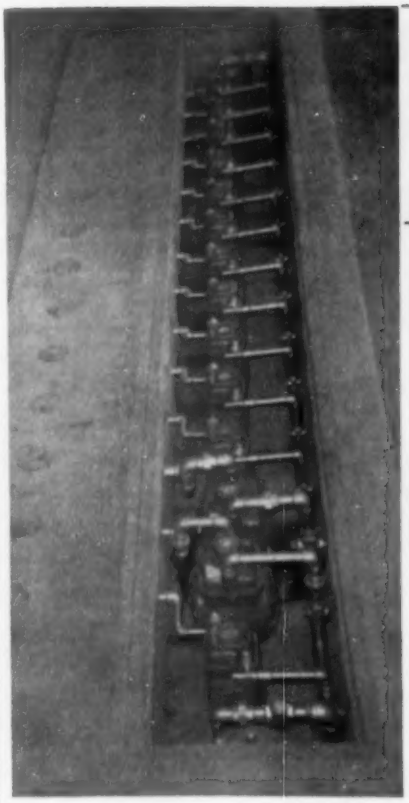

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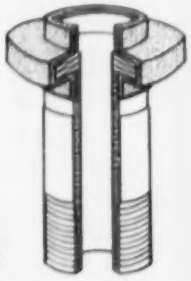

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Built-in kitchens... Selection mistakes can't be corrected once equipment is installed

objection women offer is that they can't change built-ins as often as they would like because they are part of the kitchen. Now, all of us know that most women will use a gas range for years and years without giving any thought to changing it for a newer model, but at least she has the feeling that she can change it if she wants to; and gentlemen, there is a lot of security in that knowledge.

Another feature which worries most women about built-in appliances is that they can't correct mistakes once the equipment is built-in and also they can't change their minds. They worry about the new features which they are expecting you to come out with next year.

Most of you men are not too concerned about buying a 1956 model car because you know that if next year cars come out with a device which will enable you to park sideways you will be able to buy it before too many months pass. Yet, your wives are just as sure that once they have a built-in range or refrigerator, regardless of advancements in the equipment, it will be years before they can get a new one.

I've already pointed out that built-ins do not offer the tailor-made features they're supposed to, particularly in old homes or those bought from builders. Often separates are more convenient. In buying used homes, many women do not like the idea of using an appliance after someone else has used it for a year or two. Having made home calls on lots of equipment and seeing the condition of some ranges after three or four weeks use, I can readily understand that view-point.

Another problem which comes up is that of the newlyweds who purchase freestanding equipment for an apartment and then in two or three years buy or build their own home. If they want built-in equipment they must take a loss on the second-hand equipment which they have to sell. Maybe we should follow the car industry's idea of trade-ins. With free-standing equipment most women have been content to confine their color schemes to a change in wall areas or cabinets. With built-ins, however, they feel that the equipment must blend in with the cabinets and are then limited to keeping a certain color scheme for many years.

Last, but surely not least, is the disadvantage in price between built-ins and separates. For the most part, there is little difference in price, yet the built-in requires cabinets plus expensive installation. Women can't understand why built-ins shouldn't be much less, since they don't include lights, accessories and porcelain enamel finishes. This I hope is a problem which, with greater production, will be solved.

So, there it is—a woman's view-point on built-ins. Modern? yes. Convenient? —maybe. Desirable?—of course. Practical?—sometimes. Room for improvement? — naturally. Future? — for gas built-ins, opportunities unlimited. ■

This article has been adapted from a paper titled "Built-in and Combined versus Separate Gas Appliances" presented by Miss Huck at the AGA Research and Utilization Conference, April 3-4, 1956, at Cleveland.

STOP
Corrosion
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• WATER LINES
• UNDERGROUND CABLES
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Continued from page 15

gas producers because they must be continuously increasing assets in order to plow income into exploration for new gas that will allow them to maintain gas supply.

Producers are not sitting back watching the Washington scene drift by. Some have changed their objectives for their 1956 drilling programs to concentrate on oil development rather than the planned gas ventures. Several producing companies have been going their own way on the development of a gas price formula that would have a basic concept of "cost of service" in it. None of these have been presented to the FPC, but they could turn up in one or more of the many cases now before that body.

The next Congress will probably be presented with a bill to free the producers from Federal control—it is likely that this bill will be very similar to its Harris-Fulbright predecessor because (1) the President indicated in his veto message that he went along with the basic provisions of the bill, and (2) producers feel that they gave enough ground to meet objections to the bill from utilities and/or consumers. At least one meeting of gas industry leaders interested in seeing producers freed of government regulation has been reported. Possibly, there have been others.

The President's support of the content of the Harris-Fulbright bill would indicate that it might be possible to push a new bill through Congress later in 1956, but next year seems to hold better chances for the passage of such legislation. Right now, Congressmen are shy of natural gas (or oil) producers and are probably not eager to be seen talking with them.

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GAS people

Promotions

Arizona Public Service Co., Phoenix, has announced the following changes in the general sales department: AL TUDOR, retaining the title of public information manager, fills a new position with responsibility for the company's advertising, sales promotion, publicity, publications, art and production, and special services functions. SHERMAN R. PAYNE, former advertising copy supervisor, is sales promotion and advertising manager, replacing JACKSON HOAGLAND, who resigned recently. JACK SWIFT, formerly publicity man, is publicity manager, and BILL HOPE, formerly special publications supervisor, is publications manager, heading up the expanded duties of the publications section.

JOHN F. BLACK has been promoted to assistant manager, Freyn department of the Engineering and Construction division of Koppers Co. Inc., Pittsburgh. Formerly manager of continuous casting sales, Mr. Black replaces FRED W. RYS, who was recently named a vice president of Koppers International C. A., a newly created company handling Koppers overseas operations and activities.

Bridgeport (Conn.) Gas Co. has appointed EDWARD C. BRADFIELD superintendent of distribution, succeeding the late Harry A. Sautter. At the same time, the company appointed NILS KRONOW and SIGURD CLAUSEN JR. assistant distribution superintendents.

Brooklyn (N. Y.) Union Gas Co. has promoted LLOYD A. HUNZIKER to construction engineer, construction department. W. B. CAMERON succeeds him as assistant construction engineer.

CHARLES L. HERON, formerly supervisor of systems and procedures, has been appointed assistant treasurer of the Peoples Natural Gas Co., Pittsburgh.

CHARLES W. PROVONCHEE has been elected vice president of the Providence (R.I.) Gas Co. He has been with the company since 1933.

KARL K. KING, assistant superintendent of distribution for Manufacturers Light & Heat Co., Pittsburgh, has been promoted to administrative assistant to Vice President G. E. Wilson. He will be responsible for coordination of operating department budgets and assist in compiling special reports and studies.

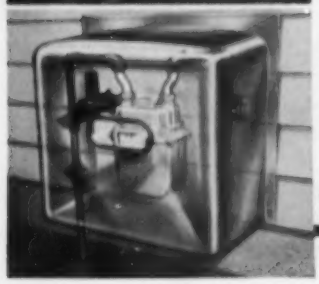
ROBERT W. OTTO, president of Laclede Gas Co., St. Louis, will become chairman of the board, and H. REID DERRICK, formerly president of the Alabama Gas Corp., will become president of Laclede. The plans are subject to action by Laclede's board. Mr. Otto, who will continue as Laclede's chief executive officer, first became associated with Laclede in 1932 and has been president since 1947. Mr. Derrick has served as president of Alabama Gas since 1953.

K. K. King
Manufacturers

R. W. Otto
Laclede

Meter Dome
solves housing problems, cuts reading costs

Yard model (right) sits directly on ground, with no rot or corrosion danger. Can be fastened to stakes. Wall model (above) has slots in flange, slips over screws.



Meter readers can make up to twice as many calls per day when sets are outside, and protected by a genuine one-piece Fiberglas Meter Dome. Emergency shut-offs are quicker, servicing is easier, annual painting is unnecessary, and installations are more economical.

Get the complete story today on money-saving plastic Meter Dome. It's your best buy in the meter cover field.

Transparent models (left) show roominess of Meter Domes. Either one easily holds any size domestic meter, meter bar and regulator.

the Buckeye Supply Co.

18 HARRISON AVE. • ZANESVILLE, OHIO

M. B. Gault
Robertshaw

B. C. Adams, Jr.
Gas Service

M. B. GAULT, with nearly 20 years service with the company, has been appointed general sales manager of the cooking appliance controls division of Robertshaw-Fulton Controls Co. He will headquarter at the executive offices of the company at Greensburg, Pa.

B. C. ADAMS JR. has been appointed general manager of the Gas Service Co., Kansas City, Mo. Before joining the operating staff of Gas Service in 1955, Mr. Adams had served with Oklahoma Natural Gas Co., Cities Service Gas Co., Trunkline Gas Supply Co., and Texas Gas Transmission Corp.

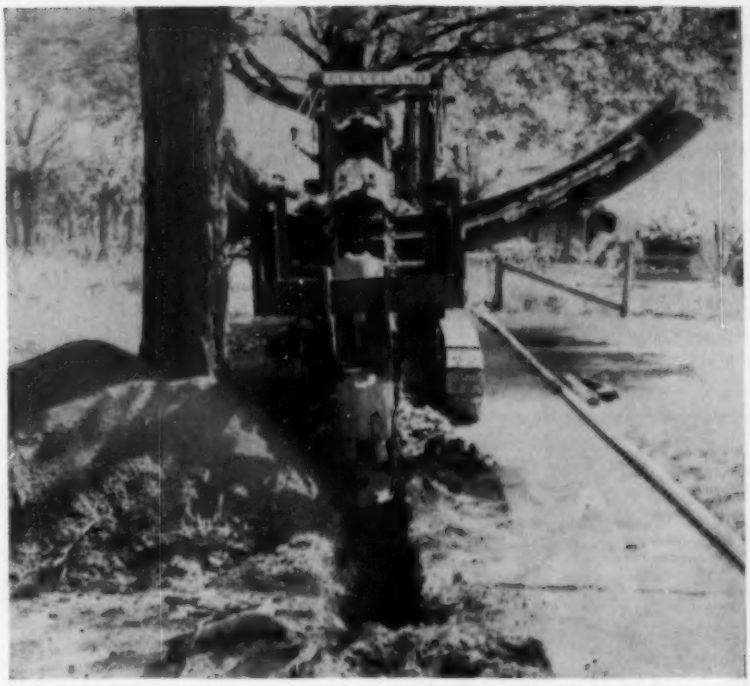
D. H. SHOEMAKER has been promoted to district sales manager of the newly expanded district sales headquarters office of the Philadelphia branch office of Rockwell Manufacturing Co.'s meter and valve division.

ARTHUR S. GREINER, attorney for Southern Union Gas Co., Dallas, has been named assistant secretary and MAURICE L. CARLSON has been appointed gas sales engineer, a newly created postion in the company.

LEO H. EAST, vice president in charge of operations of Rochester (N.Y.) Gas & Electric Corp. and a member of the board, has been elected a member of the executive committee of the board. The company has also elected THOMAS J. HARGRAVE, who is chairman of the board of Eastman Kodak Co., to the board of directors.

ALLEN BEEK has been named applications manager of Logistics Research Inc., Redondo Beach, Calif. He will be in charge of the Logistics contract computing center.

R. A. PURYEAR JR. has been elected president of Alabama Gas Corp., Birmingham, succeeding H. REID DERRICK. Mr. Puryear, who has been executive vice president since 1953, began his gas industry career in 1930 with Alabama



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small enough for the tightest quarters ...husky enough for the toughest jobs

WISCONSIN SOUTHERN GAS CO. capitalizes on their Cleveland "Baby Digger's" compactness and maneuverability on this extension job in Lake Geneva, Wisconsin. Cleveland's quick-shift reversible conveyor made it easy to get around trees, poles and water hydrants and keep trenching operations right on schedule in spite of limited working space.

Year after year after year, Clevelands are the first choice on utility company jobs like this because Cleveland-pioneered features are needed to economically satisfy the varied job requirements called for in gas distribution work.

Recognized as supreme in its field for excellence of design, materials and construction, the Cleveland "Baby Digger's" outstanding record of long-lived dependability and economical performance is attributable primarily to Cleveland's unswerving allegiance to this basic characteristic . . . *Quality*

Your local distributor will show you how Clevelands do more—for less

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CLEVELAND

people • *Continued*

Utilities Service Co., predecessor of Alabama Gas. After managing several of the company's properties, he was named general manager in 1946 and vice president in charge of operations in 1947.

JOHN J. HARVEY and EUGENE H. NELSON have been promoted to factory sales representatives by the Parsons Co., Newton, Iowa. Mr. Harvey has been with Parsons for more than six years, the majority of the time as a field service engineer. Mr. Nelson joined the company last year.

J. J. Harvey

E. H. Nelson

Parsons Co.

W. J. Flaherty

J. M. McGivern

Polyken Sales

WILLIAM J. FLAHERTY and JOHN M. MCGIVERN have been assigned as marketing development specialists in the merchandise department of the Polyken Sales division of the Kendall Co., Chicago. Mr. Flaherty will work out of Philadelphia while Mr. McGivern will headquarter in Tulsa.

CLARENCE P. KOMMERS has been promoted to the newly created post of supervisor of residential sales of the Montana Power Co. He will headquarter in Butte.

D. E. OLLENDORF has been promoted to eastern district manager for Gar Wood Industries' construction equipment division in Findlay, Ohio. He will supervise sales activities in Virginia, Maryland, West Virginia, Delaware, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, New Hampshire, Vermont, Rhode Island, and Maine.

RAY NELSON has been named to the newly created position of air conditioning engineer for Northern Illinois Gas Co., Bellwood, Ill. He has been commercial engineer for the company in its Rock River area in western Illinois.

Houston (Texas) Natural Gas Corp. has elected KENNETH FELLOW vice president and secretary. He will continue in his new position as supervisor of personnel, advertising, public relations, and insurance matters.

Koppers Co. Inc. has named JOHN E. SPEARS a divisional vice president in the gas and coke division and acting general manager of that division, which headquarters at Kearny, N. J. Mr. Spears succeeds MYRON T. HERREID, who has been granted an extended leave of absence.

Several operating personnel appointments have been made by Cascade Natural Gas Corp. WILLIAM M. LITTLE is vice president and general manager; C. W. CALLAWAY, who has managed

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NEVER-DRY PEN
Writes for Months
REPLACES OTHER MAKES • USES REGULAR INKS
Regardless of pulsations or other causes of ink failures this new Never-Dry Pen will make clean and complete records. Ink supply lasts for several months without refilling reservoir. Capillary tube from ink bottle placed in instrument case feeds pen with continuous flow. Closed system sealed from atmosphere prevents clogging and dirt accumulation.
Weight of pen is constant at all times thus insuring extreme accuracy. No slopping or dripping. Stainless steel construction—no corrosion. When ordering, specify make and type of recording instrument.
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Cascade's operations in Walla Walla, is manager of the new distribution systems at Pasco and Kennewick; and FRANK BOWERS will be district manager for the central Washington division, comprising Yakima, Prosser, Sunnyside, Grandview, Topennish, Granger, Zillah, Wapato, and Wenatchee.

RICHARD E. WHINREY, general manager of Link Belt Co.'s Ewart plant in Indianapolis, has been elected a vice president of the company.

Transfers

ELDON V. HUNT, formerly chief engineer of the Alberta Gas Trunk Line Co., Calgary, has joined the staff of Ebasco Services Inc., New York, as assistant construction manager in charge of pipeline and related activities.

WILLIAM P. CRAWLEY has joined the Carborundum Co., Niagara Falls, N. Y., as supervising textile engineer. He will establish and operate a plant for heat resistant textiles.

ROBERT H. TAYLOR has resigned as president and a member of the board of directors of Florence Stove Co. He joined the Florence organization in 1932 as a salesman. Later he became regional manager, general sales manager, vice president and, in 1948, president.

MADONNA A. BERGMAN has joined home economics department of Robertshaw-Fulton Controls Co. She will divide her time between work at the Robertshaw Research Center in Irwin, Pa., and field work.

HAROLD J. LUKE has joined Servel Inc., Evansville, Ind., as assistant to the vice president in charge of finance.

DR. JACQUES P. SIBEUD has joined Rhodia Inc., New York, as manager of laboratories.

Deaths

DR. MALCOLM S. MCILROY, well known for his development of a field network analyzer, died in March in an Ithaca, N. Y. hospital. He was 53 years old. Dr. McIlroy, professor of electrical engineering at Cornell University, was consultant to the Standard Electric Time Co., Springfield, Mass., licensed to manufacture and sell the McIlroy analyzer.

EDWARD DELMAR ANDERSON, 54, executive vice president of Northern Indiana Public Service Co., died re-

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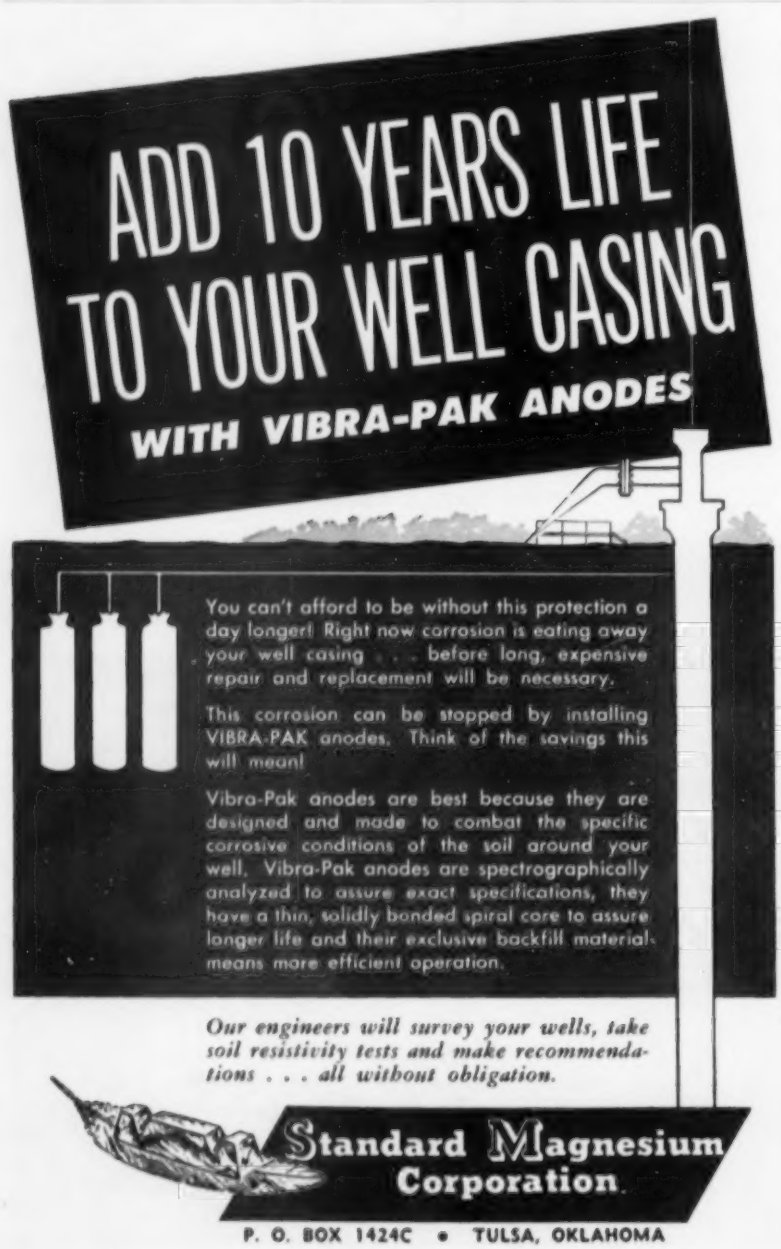
Lonsdale, Rhode Island

people • *Continued*

cently in Hammond, Ind. Mr. Anderson's career with NIPSCO began in 1924. In ensuing years, he served successively as mechanical engineering assistant, gas engineer, district manager, division manager, and general service manager. In 1938 he was elected vice president and in April 1955 he was named executive vice president.

WILLIAM LAVERTY, former superintendent of distribution of the Cambridge (Mass.) Gas Co., died recently at the age of 69. Mr. Laverty, a member of the AGA and NEGA, was associated with Cambridge Gas for 46 years. He retired from active service in July 1955.

HERMAN RUSSELL, chairman of the board of Rochester (N.Y.) Gas & Electric Corp., died in March after a long illness. As a result of his post graduate work in chemistry and gas engineer, Mr. Russell won the first scholarship established in 1900 by the Michigan Gas Association. He joined the Rochester organization in 1905, becoming president in 1929 and chairman in 1947.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You can't afford to be without this protection a day longer! Right now corrosion is eating away your well casing . . . before long, expensive repair and replacement will be necessary.
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GAS calendar

May

1-2..PCGA Residential Sales, Sales & Advertising Section—Gas Company Auditorium, Pasadena.

3..NEGA Operating Division — Sheraton-Biltmore Hotel, Providence, R. I.

6-9..LPGA Convention and Trade Show—Conrad Hilton Hotel, Chicago.

7-8..AGA Residential Gas Section, Eastern Gas Sales Conference —Park-Sheraton Hotel, New York.

7-8..Gas Compressor Institute — Randall Cafeteria, Liberal, Kan. (Co-sponsors: University of Kansas & Southwest Kansas Petroleum Industry.)

7-10..AGA Distribution, Motor Vehicles, and Corrosion Conference—Congress Hotel, Chicago.

7-11..AGA Commercial Gas School — Edgewater Beach Hotel, Chicago.

10-11..AGA Gas Supply, Transmission & Storage Conference—Conrad Hilton Hotel, Chicago.

11-12..PUAA Annual Convention — Philadelphia, Pa.

16..NEGA Appliance Servicing Conference—Bancroft Hotel, Worcester, Mass.

16-18..AGA Chemical Engineering & Manufactured Gas Production Conference — Philadelphia.

22..PCGA Commercial and Industrial Sales, Sales and Advertising Section — Claremont Hotel, Berkeley.

22-24..Pennsylvania Gas Association —Pocono Manor Inn, Pocono Manor, Pa.

24-25..Natural Gas & Petroleum Association of Canada—Sheraton Brock Hotel, Niagara Falls, Ont., Canada.

31-June 1..11th Annual Short Course in Gas Technology—Texas College of Arts and Industries, Kingsville, Texas.

30-June 2..Interstate Oil Compact Commission—Dallas.

June

4-8..National Fire Protection Association 60th Annual Meeting—Hotel Statler, Boston.

5-6..PCGA Domestic Research & Utilization Conference—Ambassador Hotel, Los Angeles.

11-13..Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown.

25-26..Michigan Gas Association—Grand Hotel, Mackinac Island, Mich.

26-29..Canadian Gas Association—Manoir Richelieu, Murray Bay, Quebec.

July

24-27..NARUC Annual Convention—Sheraton Palace Hotel, San Francisco.

September

7..New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

11-13..Pacific Coast Gas Association Annual Meeting—Coronado, Calif.

12-14..Mid-West Gas Association Gas School and Conference—Iowa State College, Ames.

12-14..3rd Annual Electrical Conference of the Petroleum Industry (AIEE)—Kansas City, Mo.

14-15..Maryland Utilities Association Fall Conference—Cavalier Hotel, Virginia Beach, Va.

18-19..AGA Accident Prevention Conference—Shirley-Savoy Hotel, Denver.

19-21..Southeastern Gas Association—Hotel Sir Walter, Raleigh, N. C.

October

15-17..AGA Annual Convention—Atlantic City, N. J.

1957

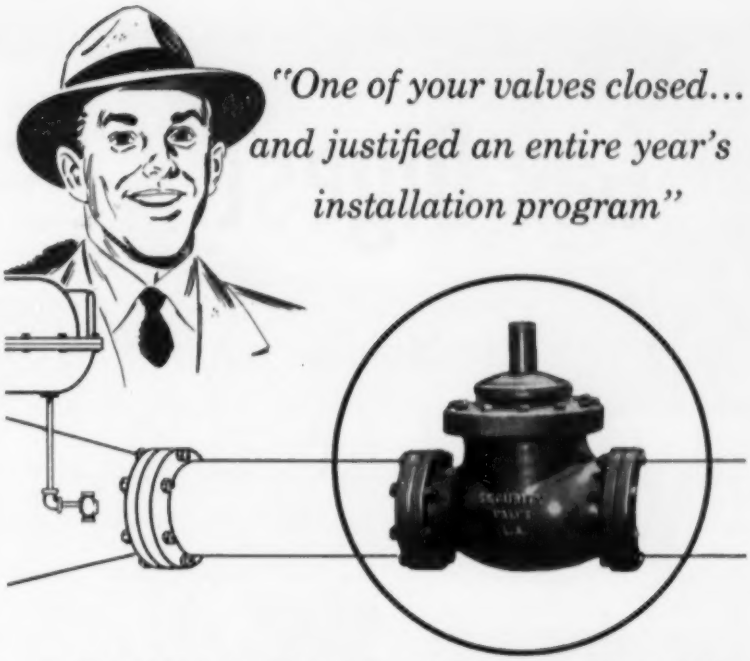
March

11-15..National Association of Corrosion Engineers—Kiel Auditorium, St. Louis, Mo.

18-21..MidWest Gas Association—Hotel Nicollet, Minneapolis.

21-22..New England Gas Association Annual Meeting—Hotel Statler, Boston.

28-29..Oklahoma Utilities Association Annual Convention—Tulsa.



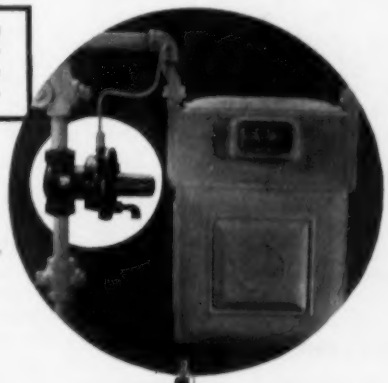
"One of your valves closed... and justified an entire year's installation program"

■ That's the experience of just one of the major gas companies and gas-using industries from coast to coast who have standardized on Security Automatic Shut-Off Valves. Because of their *absolute* protection against overpressuring, the operation of a single Security Valve can pay for a system-wide installation.

Security Valves are positive and always dependable . . . they are engineered for one specific function. Vital in congested areas, they eliminate both the expense and hazard created by high-capacity vent lines necessary when other over-pressure protection devices are employed.

A *complete* line, Security Automatic Shut-Off Valves are available in sizes ¾" to 12" for use on lines operating on inches water column to 1500 psig. They can be installed up or downstream of the regulator and controlled directly or by means of a pilot line.

Security Automatic Shut-Off Valves range from ¾" for domestic lines (right) to large distribution line sizes (above).



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Gas Digest

A digest of what's new in products and trade literature compiled by the editors of GAS as a reader service.

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 107, 108

1. Hydraulic backhoe

Sherman Products' new hydraulic backhoe features twin-crown cylinders for extra balanced power, permitting fast, efficient digging through any soil. Specifically designed and built for attachment to Fordson-Major tractors, the Sherman Major reaches as deep as 12½ ft. With a 180° arc of swing, it can clear a height of 8 ft 8 in. for loading trucks.

The digger has heavy steel plate construction, large diameter hinge pins, replaceable hardened steel bushings and heavy-duty steel castings. A new bucket linkage provides maximum wrap-around and also a stroke up to 5000 lb effective pressure through nearly 9 ft of bucket lip travel.

Sherman Products Inc.

■

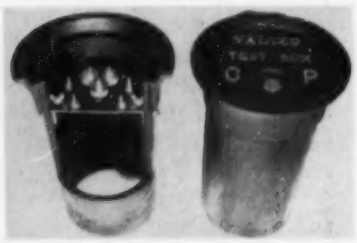
2. Tape coating

Polyken No. 940 is a new polyethylene tape coating for corrosion control on fittings and irregularly shaped contours. The new coating has been designed for use on ells, valves, fittings, T-joints, and general use on in-plant pipe.

A proper balance of dead stretch for contour conformability and elasticity for wrap-tight fit to irregular shapes and surfaces makes it particularly suitable to these applications.

Polyken Sales Div.

■



3. Cathodic protection station

Valvco Inc. has developed a cathodic protection test station designed for ground level installations.

The stations consist of a 5-in. ID shaft of Orangeburg pipe with a heavy cast iron cover and collar. A 5-in. MC Mille terminal block is located inside the shaft within 3 in. of the surface.

The 5-in. MCM terminal blocks are made of Glastic, Grade MM fiberglass reinforced polyester laminate. Two brass nickel-plated shorting straps are supplied with each terminal block. Terminals and nuts are ¼-in.-20 thread, brass, nickel-plated. Lock washers are bronze.

Valvco Inc.

■

4. Holder repair material

A new general repair material which has been successfully used in repairing gas holders, pipes, and gasoline tanks, is available from Ed Conley Plastic Corp. Conley-weld C-1 C-2 is a versatile bonding material that also can be used to fill cracks in metal castings, connecting metal or plastic pipe and repairing valves.

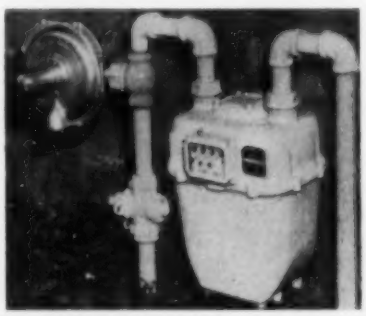
In pipe repairs, it will hold pressures of 2000 psi when wiped into small holes and cured.

The material provides strong adherence to many materials including metal, wood, glass, ceramic masonry, rubber, most plastics and porcelain. It has withstood shear tests exceeding 3000 psi, and has excellent resistance to solvents, diluted acids, alkalies, salt water and sour crude oil.

This product is composed of two parts which have unlimited shelf life. When equal portions are mixed, it is ready for use. The bonding material is available in kit and bulk form.

Ed Conley Plastic Corp.

■



5. Service regulator

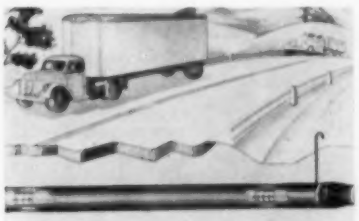
Because of a new weather-resistant aluminum diaphragm case, Rockwell Manufacturing Co.'s newly redesigned "173" service regulator is about 2 lb lighter than earlier models.

Another new feature of the regu-

lator is a projecting boss at the bottom of the case, which can be tapped for linking with an extra line when a service regulator is used for pilot-loading a principal regulator—or when a two-stage pressure system is required. It is particularly useful for pilot-loading systems with outlet pressures of less than 1 lb.

Rockwell Manufacturing Co.

■



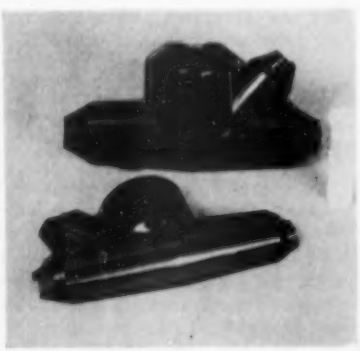
6. Neoprene end seals

Neoprene end seals that go on in minutes and will seal against pressures ranging up to 300 psi are incorporated in a new design of crossing insulators for pipelines passing under highways. The seal closure—a pressure-sealing rubber zipper with molded lips—effectively shuts out liquids and dirt. Any additional pressure actually tightens the seal.

The pipe-supporting bands of the new insulator from F. H. Maloney Co. have sled-type steel runners tightly bonded to pads of neoprene. The steel band is ribbed ½ in. from each edge to prevent cold flow of the pipe wrap.

F. H. Maloney Co.

■



7. Splicing kit

Moisture-proof splices for cathodic protection installations that can be insulated in less than 10 minutes and can be used with assurance even under water are possible with a new splicing kit from Minnesota Mining.

The kit, designed for low voltage applications in rectifier ground bed systems, consists basically of a single-use plastic mold and an envelope of self-mixing Scotchcast insulating resin No. 4.

Called the Scotchcast splicing kit No. 90-B1, it makes possible complete encapsulation of the splice in liquid epoxy-type resin. Crux of the splicing kit is the Unipak container which contains the resin on one side of a built-in plastic divider and the activator on the other. The kit also consists of two mold halves and a pouring spout.

Minnesota Mining & Manufacturing Co.

■

8. Gas indicator

Four models, each intended for specific functions, are included in a new line of combustible gas indicators from Mine Safety Appliances Co.

Model 30 has been developed primarily for utilities to test manholes, sewers, and other underground areas. It can differentiate between natural gas and petroleum vapors.

Model 20 is designed for multiple calibrations. A selector switch on the instrument panel has five different settings for different gases or vapors. No calibration curves are necessary to interpret results of test. Model 21 is identical, except that it has a dual scale controlled by a selector switch. Model 40 is designed specifically for industrial hygiene work.

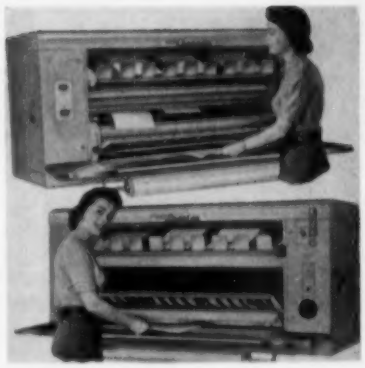
Mine Safety Appliances Co.

■

9. Whiteprinting machine

C. F. Pease Co.'s new Twin-Table model whiteprinting 42-in. machines will expose and develop ammonia-type White-prints up to 32 ft per minute. They reproduce any translucent copy—engineering drawings, tracings, maps, film, letters, office forms, etc.

The Champion printer has automatic copy separation, making it a one-step feed machine, while the Sparton requires manual copy separation, resulting in two-step feed operation. Each

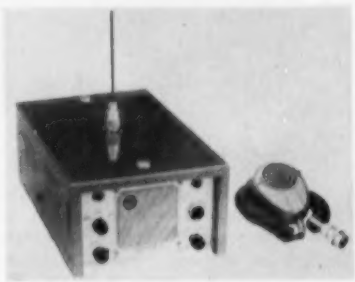


model has a 300-watt mercury lamp for rapid printing.

The ammonia developer has a stainless steel perforated plate with slip screen and ribbed rubber sealing sleeve to convey prints through the ammonia chamber.

C. F. Pease Co.

■



10. Radio-telephone

A new low power industrial radio-telephone from Kaar Engineering Corp. has been designed specifically for installation on materials handling trucks, messenger vehicles, and transportation units.

Designated the IMP, the unit is capable of performing the triple duties of base station, mobile unit, and mobile public address system.

With a range of from one to five miles, the IMP can operate on 6 v a-c, 12 v d-c, or 117 volts a-c. Built to withstand rough handling, it is shock-mounted and all controls are recessed.

Kaar Engineering Corp.

■

11. Electrode

General Electric's welding department is producing a new powdered metal, low hydrogen electrode which is reportedly faster in lineal speed by up to 30% than conventional low hydrogen electrodes.

Designated Strikeasy LH-2, the new electrode, according to G-E, is faster because of a higher desposition rate,

reduced slag cleaning time and spatter loss.

Recommended for use with d-c reverse current, it can also be used with a-c current. Ultimate tensile strength, as welded, is rated at 80-83,000 psi, yield strength at 70-73,000 psi with elongation of 34% in a 2-in. specimen.
General Electric Co.

■

12. Pipe clamp

Pipe leaks are repaired quickly, permanently and economically with the new Atlas pipe clamp and patches which are shaped to fit specific pipe sizes and assure a skin-tight fit when gasket is compressed.

Two styles are available: The saddle type in four sizes for use on pipe 6 in. and less, and the chain type for all sizes 6 in. and up. Patches are made of steel with either neoprene or asbestos gaskets. The patch can be welded to the pipe or the clamp can be left on until it is convenient to weld the patch.
Atlas Industries Inc.

■

TRADE LITERATURE

13. Instrument bulletin

Bristol Co.'s Dynamaster electronic potentiometer and bridge instruments for recording and controlling are discussed in a new bulletin. The three main sections of the two-color bulletin cover details of the instrument and its components; sensing elements and special attachments; and other manufacturers' equipment in which Dynamasters have been incorporated. The 64-page bulletin (P1245A) is illustrated with over 110 photos and drawings.
Bristol Co.

14. Utility body booklet

A new bulletin on Pierce general service utility bodies has recently been released by the manufacturer, Auto Body Works Inc. The booklet describes and illustrates specifications and optional equipment for all the company's basic models.
Auto Body Works Inc.

■

15. Crawler bulletin

"The Crawler . . . Backbone of Construction," a new 12-page booklet from American Tractor Co., illustrates how and where the company's 30-to 60-hp TerraTrac tractors fit in the construction picture. Of special interest is a chart comparing U. S. construction volume in all major classifications for 1954 and 1955, and showing the anticipated volume for 1956.
American Tractor Corp.

■

16. Lubricant book

Ucon synthetic fluids and lubricants, used as mechanical lubricants, hydraulic fluids rubber an dtextile lubricants, heat-transfer fluids, anti-foam agents, solvents, and formulation components, are covered in a new 52-page booklet issued by Carbide & Carbon Chemicals Co. Properties, applications, and characteristics of these polyalkylene-glycol derivatives are discussed.
Carbide & Carbon Chemicals Co.

■

17. Copy equipment brochure

Some of the most important developments in the use of xerographic copying equipment since it was first announced in 1950 are described and illustrated in a new six-page brochure from the Haloid Co. According to the company, these developments mean lower costs per copy, fewer operations and less labor, higher quality in the finished product as shown by sharper, blacker, and denser images.
Haloid Co.

■

18. Insulation booklet

Johns-Manville's new booklet, "Thermobestos Pipe and Block Insulation," gives complete information on this hydrous calcium silicate insulation for hot outdoor piping and process equipment. Sections on the prefabrication of fittings, physical and thermal properties, and tables of available sizes and thicknesses are included in the booklet.
Johns-Manville

19. Manometer bulletin

Four basic types of manometers ranging from the simple U-tube to the ultra-precision models are described in a new bulletin from the Meriam Instrument Co. Intended as a convenient, quick reference guide to manometer-type instruments, the bulletin also provides aids to proper selection.
Meriam Instrument Co.

■

20. Engine pamphlet

Two new engines (310-hp D337 and 200-hp D326) are introduced by Caterpillar Tractor in a new bulletin. Described in the pamphlet are possible engine arrangements and recent engineering and research developments incorporated in the engines.
Caterpillar Tractor Co.

■

21. Rectifier bulletin

A new bulletin on selenium rectifiers for cathodic protection against corrosion has recently been issued by Westinghouse Electric Corp. The bulletin includes a listing of available types with specifications and ratings. Also included is an explanation with diagrams of the operation of the rectifier.
Westinghouse Electric Corp.

■

22. Trencher leaflet

Earth Equipment Corp.'s Model 60 Everett trencher is described in a new two-color, four page leaflet. Features of the tractor-mounted digging mechanism are illustrated and specifications are presented.
Earth Equipment Corp.

■

23. Heat exchanger bulletin

Schutte & Koerting has published a bulletin (Supplement 12-HS) which describes its new heat exchanger, Type BD. Both single-pass and two-pass designs are described, and the bulletin contains data on features, construction, and materials of construction.
Schutte & Koerting Co.

■

24. Cooling tower bulletin

The Foster Wheeler induced draft cooling tower is described in a special bulletin, CT-56-1. In addition to a three-dimensional wash drawing of a tower cell, it includes perspective drawings of major equipment features.
Foster Wheeler Corp.

FOR MORE INFORMATION...
on New Products and Trade Literature

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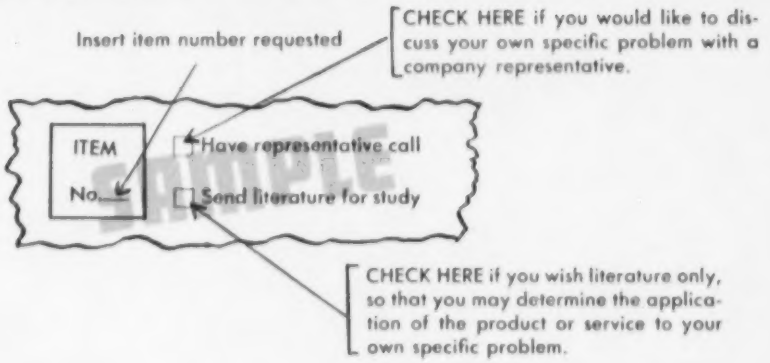
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198 SOUTH ALVARADO ST.
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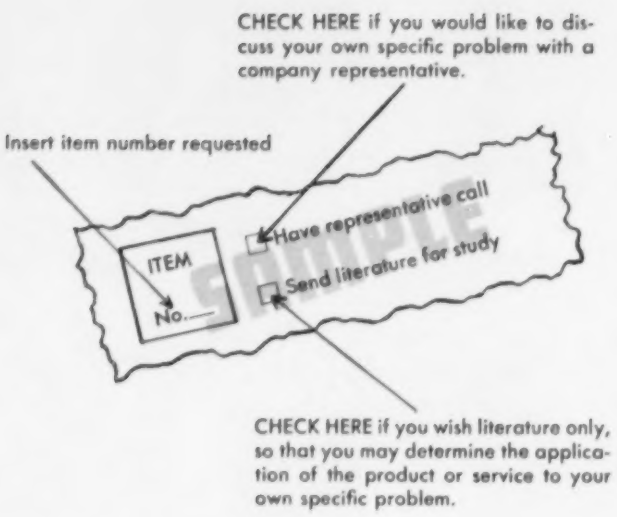
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Model 590 — Residential Air Conditioner

GROW BIGGER WITH bryant

and here's one way you can

GROW BIGGER WITH bryant

THE GREATEST PROFIT BUILDING PROGRAM EVER OFFERED—THE NEW

bryant

Dealer Development Program

To help you sell MORE heating and air-conditioning equipment . . . profitably

Bryant now offers you a Dealer Development Program that *will* help you sell more . . . more profitably! There are seven steps in the complete program. Each is designed to assist you in one phase of your business. This is a practical, down-to-earth program prepared from years of experience in helping heating and air-conditioning dealers conduct a better, more profitable business. You have to see the details to fully appreciate its many benefits. But just to give you an idea of the scope of the program...

First time a program like this has ever been offered to the heating and air-conditioning dealer. It is completely explained in this beautiful 64-page book. Ask your Bryant Distributor for a copy and other details. Act today!

HERE ARE A FEW OF THE TOOLS

CHART TALKS THAT REALLY SELL

. . . in full color. Charts are in a handsome, flip-over binder, with plastic envelopes to hold the pages. Permits keeping story up to date as well as the insertion of local material.

SURVEY AND ESTIMATE FORMS

. . . a complete set for your use with your customers. There is a detailed form for each type of equipment called for by the job. Makes estimating simple and accurate and easy for your customers to understand.

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. . . this handy, pocket-size booklet lists all features of each individual piece of equipment, together with corresponding owner benefits. Makes selling easy. A terrific sales tool.

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. . . the most complete guides to estimating the heating and cooling requirements of a home. Make it possible to make complete engineering layouts and calculations in less than an hour's time. No other guides just like these.

AND THERE'S LOTS MORE. FOR THE COMPLETE STORY—AND HOW YOU CAN TAKE FULL ADVANTAGE OF THIS COMPLETE PROFIT-PRODUCING PROGRAM—**CALL YOUR BRYANT DISTRIBUTOR TODAY.**

and here are 8 MORE reasons why you'll GROW BIGGER WITH BRYANT

1. Your customers know and trust the name Bryant . . . famous for 47 years as the leading name in home comfort. That's why a Bryant is easier to sell.

2. From small home to mansion, or for store or factory, there's a Bryant to fit the budget and the need in gas or oil furnaces, boilers, air conditioners, space heaters, unit heaters, water heaters.

3. You build customer confidence when you install Bryant . . . the highest quality heating, cooling and water heating equipment made.

4. You profit more with Bryant because of the Bryant Business Development Program, the most complete program in the industry.

5. You get *sales building tools* that increase your sales and profits.

6. You have the help of a nearby Bryant distributor who gives you *complete engineering, sales and service help.*

7. You are backed up by *powerful national advertising* designed to help you.

8. You are given the most complete *co-op advertising to build sales in your own community* offered by any manufacturer in the industry.

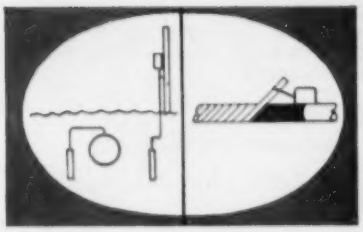
Don't miss this tremendous opportunity to build your profits through the BRYANT OPERATION PROFIT and the Bryant Dealer Development Program. If you want to make more sales, more profits, it will pay you to get the full details. So call your Bryant Distributor today, or write, Bryant, 48 Monument Circle, Indianapolis 4, Indiana.

be Mr B in your community

and GROW BIGGER with bryant

Corrosion Prevention

DISTRIBUTION • TRANSMISSION



By GUY CORFIELD

A critical look at cathodic protection

THAT cathodic protection is an effective means of controlling corrosion of buried pipelines has been demonstrated many times, and is attested to by its widespread and expanding use by operators of underground metallic structures. There is increasing interest in the economics of cathodic protection and a realization that there are circumstances when some other means of corrosion control, or even no attempt at control, may be more financially sound, but there is seldom any question as to its *technical* effectiveness under all circumstances, provided that the installation has been properly engineered, tested and maintained. It seems to be generally accepted that a structure is immune from corrosion if it is 0.85 volts negative to earth in terms of a copper-copper sulfate electrode, or in the case of a bare or very poorly coated metallic surface, if it is receiving a few milliamperes of current, per average square foot, from the soil.

It is not desired to in any way discourage the use of cathodic protection under normal conditions. However, in the interest of preserving confidence in it, and avoiding circumstances which might bring it into disrepute, it seems timely to mention that situations occasionally arise in the experience of corrosion engineers which indicate that under some conditions cathodic protection may not be entirely effective and that there are some unanswered questions which should be resolved. With the hope that they may stimulate discussion, and possibly research if no authentic information is available, the following circumstances are submitted under which *cathodic protection, as normally applied and maintained, may not prevent corrosion:*

1. Where pipe coating is loose and sagging, and relatively intact, but broken in spots where water is admitted—corrosion can occur in the wet environment under the coating, but the coating may act as a shield to prevent the cathodic protective current from reaching the surface of the pipe.

2. Where anaerobic bacteria are numerous and active. Some engineers believe that normal application of cathodic protection will suppress the activity of these bacteria, while others claim that a higher voltage than 0.85 is necessary but disagree as to how much higher. There is even the thought that the hydrogen, which is released at the pipe surface by the protective current, may actually stimulate the bacteria rather than suppress their activity.

3. Where the soil resistance is very high, but "spotty" enough to permit significant corrosion — the protective current may not be able to reach all points on the pipe because of the high resistance.

4. Where sharp stones are in contact with the metal surface of the pipe, and the soil is not wet—as in the example above, the protective current may not be able to reach the metal where a sharp point or edge of rock is touching it.

5. Where there were deep pits prior to the application of cathodic protection—the current may not be able to penetrate to the bottom of the pits.

6. Where the pipe is bare or substantially bare, and particularly if it is of large diameter, the protective current may not be able to reach all points on the surface, particularly on the side remote from the anode.

There are two other questions which arise in connection with cathodic protection, on which no general agreement seems to have been reached. The first is practical and important, but the second perhaps academic:

1. Does the voltage across the pipe coating, earth to pipe, deteriorate the coating and, if so, what value should normally not be exceeded? Most corrosion engineers appear to feel that a voltage in excess of 1.5 should be avoided, but published information on the subject is limited. More specific data would seem to be desirable not only to assist in design (station sizing and spacing), but also from overall economic considerations.

2. Inasmuch as in oil refinery operations, embrittlement and deterioration of steel vessels is said to be caused by the penetration of nascent or atomic hydrogen, is it possible that under some circumstances the release of hydrogen at the pipe surface, by the cathodic protective current, could cause deterioration of the pipe?

How zinc controls corrosion

The American Zinc Institute, national trade association for the zinc industry, has just announced the production of a new 16 mm. sound and color motion picture entitled "Zinc Controls Corrosion," which "dramatically tells how zinc in its role of 'protector' controls corrosion to lengthen life, and to minimize maintenance and replacement costs."

It is stated that the film, which has a running time of about 35 minutes, demonstrates the general mechanism of corrosion as well as how zinc controls it. It describes new continuous galvanizing lines, the hot dip galvanizing of large structural parts, and means of corrosion prevention with zinc such as cathodic protection, metallizing, sherardizing, and painting.

Bookings for this film are now being accepted at the American Zinc Institute Inc., 60 E. 42nd St., New York 17. It is available for showing at no charge.

GAS associations——

Chicago host to combined conferences

Chicago is the host city for the first combined conference of the American Gas Association's distribution, motor vehicle and corrosion and gas supply, transmission and storage sections when they meet May 7-10 at the Congress and Conrad Hilton hotels.

Scene of the distribution conference, running from May 7-10, is the Congress, while the transmission conference, on the 9th and 10th, headquarters at the Hilton. More than 1500 engineers, technicians, and operating men from every phase of gas industry operation are expected.

Programs are arranged so that discussions primarily on utility operations occupy Monday and Tuesday and transmission line operations are featured on Thursday and Friday. Wednesday's program is devoted to subjects of interest to all.

Although both conferences follow the traditional procedure of morning general sessions and discussion-type afternoon sessions, another innovation is a general luncheon. Featured on the first three days of the week, the luncheons are open to all delegates. Following luncheon, men adjourn to individual meeting rooms for specific sessions.

In addition to five general sessions, the meeting offers a variety of committee-sponsored sessions. The AGA automotive and mobile equipment committee and the Edison Electric Institute transportation committee is offering five joint sessions. Also scheduled are three corrsion sessions, two on distribution design and development, two on construction and maintenance, one morning session and one luncheon-afternoon meeting on metering, and two luncheon-afternoon affairs on customer service.

Luncheon-afternoon sessions also are scheduled on natural gas production, gas measurement, underground storage, pipelines, compressor stations, gas dispatching, and communications.

Service awards to four 1955 operating section committee chairmen and six past committee chairmen highlight the Monday and Thursday general sessions.

Committee chairmen presiding at general sessions are F. H. Bunnell, Consumers Power Co., distribution committee; John B. Corrin, Hope Natural Gas Co., underground storage; N. P. Peifer, Manufacturers Light & Heat Co., corrosion; Dwight Sprow, Natural Gas Pipeline Co., transmission; and W. H. Weber, customer service.

Tying the two conferences together on Wednesday evening is the social hour in the Gold room of the Congress.

Public utility ad men celebrating 35th year

To celebrate its 35th birthday as a national association of public utility company advertising men, the Public Utilities Advertising Association of America has slated its national convention at Philadelphia's Hotel Warwick May 10-11, thus tying in with that city's celebration of Benjamin Franklin's 250th anniversary.

In an atmosphere studded with tributes to America's first outstanding printer, and, some say, the first ad man, PUAA people will hear an impressive slate of speakers including Theodore Roosevelt III, president of Americans for the Competitive Enterprise System; Nicholas Samstag of *Time Magazine*, and Edwin Vennard, managing

such even thickness in diaphragm leather

Once again, Lancaster leads in meter diaphragm improvement for better meter performance. Not only is the finest quality lambskin used exclusively, but we are now able to furnish leather of consistently more even thickness on both sides and across the entire diaphragm.

The even thickness, flexibility and non-shrinkable leather used in Lancaster groove type metal rim diaphragms assure greater accuracy and less wear on other parts. It is another reason why Lancaster diaphragms cost you less in the long run.

Send for a sample and see for yourself.

Lancaster METER PARTS CO.
POST OFFICE BOX 278 LANCASTER, OHIO

director-elect of the Edison Electric Institute, among others.

One of the highlights of the meeting will be the awarding of prizes in the association's Better Copy Contest, the oldest continuing contest in the advertising world.

Members of advertising and public relations departments in the electric and gas utilities in the Philadelphia area, along with members of the Poor Richard Advertising Club, will take the important role of hosts and guides for the association meeting.

Officers of PUAA are: president, Raymond W. Fenton, Peoples Gas Light & Coke Co., Chicago; first vice president, Robert H. Bridges, Cleveland Electric Illuminating Co.; second vice president, Richard D. Furber, Northern States Power Co., Minneapolis; third vice president, George W. Kindon, Philadelphia Electric Co.; secretary, George G. Hanel, Connecticut Light & Power Co., Hartford, and treasurer, Mead Schenck, Interstate Power Co., Dubuque, Iowa.

Spotlight on commercial gas at Chicago school

For five days, May 7-11, the Edgewater Beach hotel, Chicago, will be the scene of the American Gas Association's Commercial Gas School where an intensive course of training will be given by leaders in the respective fields of commercial cooking and large volume feeding operations where gas equipment is of major importance.

The sales training committee under the chairmanship of Lester A. Dubberke, Milwaukee (Wis.) Gas Light Co., has selected subjects and lectures on the various phases of selling commercial gas that will give valuable technical information and sales training to the students. The course has been designed to provide basic training and will also serve as a refresher course for all those who sell or promote gas and commercial gas equipment.

The five-day course will cover such equipment as fryers, baking and counter appliances, controls, ventilation, water heating, steam generation, incineration, selling, cost calculations, service and installation. Highlights of the week's activities will be a display of typical modern commercial gas equipment in the schoolroom, and demonstrations on deep fat frying and baking. Also a cooking demonstration at the National Restaurant Exposition and an inspection tour of this show will be part of the course.

Students will be brought up to date on all available equipment to help

The man in the picture isn't hanging out the family wash.

As a matter of fact, the family wash is hanging him.

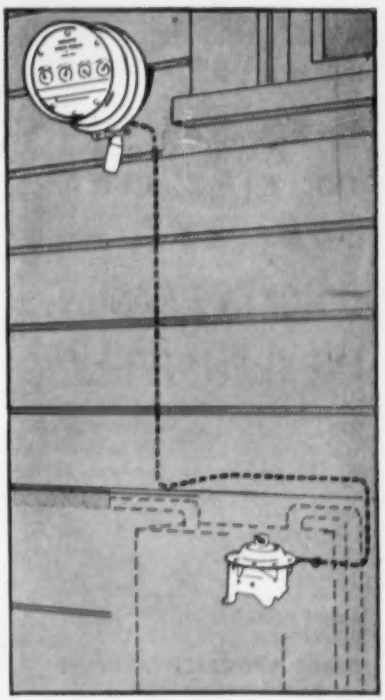
And it isn't even his family. The man in the picture is a gas meter reader. His job is to go down into a lot of strange basements and find out how much gas the customers have been using.

In doing this, he frequently runs into some uncomfortable situations. For instance, we know of a gas meter reader who went down into the basement of a house in 1942 and was never heard from again.

Naturally, it put his company in an embarrassing situation — they didn't know how much to charge for the amount of gas used.

Now this sort of thing *can* be avoided. You can install Sangamo Gas Telemeters on your present tin meters. The Telemeter brings the gas meter reading *outside* the premises. And the nice thing about a Telemeter is that no one who ever tried reading one has ever disappeared.

We wrote everything down we thought you'd like to know about Telemeters and had it published under the title, "Outdoor meter reading is here . . ." or Bulletin 802. We've reserved a copy for you, so write for it today.



it's easier to get the reading ON THE OUTSIDE!

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

GT56-5

them protect and expand the gas load in this highly competitive volume cooking field.

A question-and-answer period will follow each morning and afternoon session.

NEGA elects Faulstich president for 1956-57

Highlighting the 30th annual convention of the New England Gas Association, held recently in Boston, were panels on building desirable group relationships and cooperation with industry allies.

New officers of NEGA are (front row, l to r): F. H. Faulstich, president; Harold E. Ayer, retiring president; Edgar G. Rhodes, 1st vice president. Back row: Andrew W. Johnston, 2nd vice president; Otto Price, treasurer; H. Coleman Moore Jr., assistant treasurer; and Clark Belden, clerk and managing director.

Elected president for the coming year was Fred H. Faulstich, vice president, Springfield (Mass.) Gas Light Co. He will be assisted by Edgar G. Rhodes, president and general manager, New Britain (Conn.) Gas Light Co., 1st vice president; Andrew W. Johnston, vice president in charge of gas operations, Boston (Mass.) Gas Co., 2nd vice president; and Otto Price, vice president in charge of accounting, Boston Gas, treasurer. Clark Belden, managing director of the NEGA, will serve as clerk.

Two men were honored by the association when it presented accomplishment awards to Gordon G. Howie and Andrew W. Johnston. Both men have made many constructive NEGA contributions over a period of years.

E. L. Hall, AGA lab head, dies in Cleveland

Edwin L. Hall, director of the American Gas Association Laboratories in Cleveland and Los Angeles and an assistant managing director of the association, died suddenly at his home in Cleveland, Ohio, April 1 at the age of 53.

An internationally known authority on gas manufacturing and gas appliances, Mr. Hall held more than 25 patents on gas-making processes. In 1950, he was presented the AGA Distinguished Service Award, the highest honor bestowed by the association, for having made the most outstanding contribution of any individual toward the advancement of the gas industry.

PROTECTO WRAP
PATCH PADS*

REPAIR
SKID DAMAGE
TO PIPE LINE
COATINGS....
QUICKLY...EASILY...
INEXPENSIVELY...

WHERE DAMAGE OCCURS
DAMAGE OCCURS from skids before the pipe is lowered into the trench. The problem is to coat the damaged area where it has contacted skids.

REPAIR IS MADE efficiently with Protecto Wrap PATCH PADS which consist of inorganic glass fiber impregnated with bituminous pipe coatings of coal tar or asphalt base with asbestos felt backing. Pads are shaped to hold sufficient hot tar which is poured on to the pad before application. The hot tar makes the pads flexible and adhesive and they may be applied either by hand or with the use of application cradle as shown.

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DENVER, COLORADO

He was cited for his original contribution in the development of equipment and processes for the manufacture of high Btu gas. Mr. Hall developed and gave to the gas industry a new process for the manufacture of gas of high heat content from inexpensive, low-grade oils. Through his process, manufactured gas companies were able to increase production and

E. L. Hall

effect savings of as much as 30% in the cost of manufacturing gas at a time when expansion plans of the industry were greatly hampered by shortages of steel and other vital materials.

Also, in 1952, Mr. Hall was awarded the Walton Clark Medal by the Franklin Institute of Philadelphia. He was cited for "his many contributions to the gas industry."

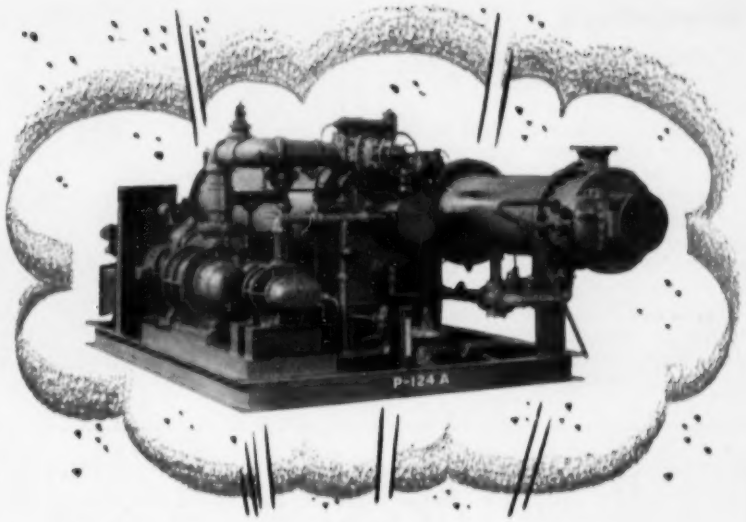
On Nov. 1, 1947, Mr. Hall was appointed director of the association's testing laboratories in Cleveland and Los Angeles, succeeding R. M. Connor, who resigned from active duty as director due to ill health. Mr. Hall was appointed an assistant managing director of the association in June 1950.

Mr. Hall made valued contributions to the gas industry before and after joining the association staff. Under his direction, the floor space of the testing laboratories was more than tripled. In addition to the many gas production and gas utilization research projects carried on at the laboratories under the PAR plan, more than 5600 individual models of gas appliances are tested there annually to ensure that they meet the right requirements of safety, dependability and efficiency that are American Standards.

Johnson succeeds Wrench as head of midwesterners

George B. Johnson, Minneapolis Gas Co., is the newly elected president of the Mid-West Gas Association, succeeding M. K. Wrench, Metropolitan Utilities District, Omaha.

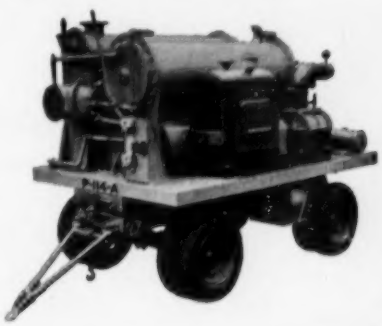
Elected with Mr. Johnson at the group's annual convention held in Omaha recently were P. C. DeHaan,



When PROTECTION is needed... call on R-C Inert Gas Generators

At a moment's notice of fire or explosion dangers, smothering gas flows instantly from Roots-Connersville Inert Gas Generators. From either stationary or mobile units, oxygen-free gas is constantly available for purging or other operations, to protect lives, property and production. Initial cost is low, no full-time operator is needed, and reduction of insurance premiums frequently offsets the original investment.

For details on how R-C Inert Gas Generators afford constant, instant protection, just call your nearest Roots-Connersville office or mail the coupon.



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Company _____

Street and City _____

1st vice president; H. R. Slocum, 2nd vice president; and Everett E. Baxter, secretary-treasurer.

The 453 attendants at this convention made it the biggest in the association's 51-year history.

Among speakers were John F. Merriam, president, Northern Natural Gas Co.; Harry Bowser, Servel Inc.; Myrna Johnston, director of foods and equipment department, *Better Homes and Gardens;* and Mrs. Amber C. Ludwig, equipment editor, *What's New in Home Economics.*

Newly elected officers of the Mid-West Gas Association are (from left): P. C. De Haan, 1st vice president; Everett E. Baxter, secretary-treasurer; George B. Johnson, president; and H. R. Slocum, 2nd vice president.

Also on the program were Morris E. Jacobs, president, Bozell & Jacobs, who spoke on "Public and Employee Relations"; R. L. Stephenson, Lone Star Gas Co., "Gas Industry Development Program—And You"; and Howard White, Liquefied Petroleum Gas Association, "Let Me Tell You About My Operation."

A. M. Schultz, Minneapolis Gas Co., moderated a panel discussion on how to retain full load in face of today's competition. Panel members included W. V. Bell, Metropolitan Utilities; S. M. Johnson, Minnesota Valley Natural Gas Co.; Carl J. Olsen, Central Electric & Gas Co.; and J. Roscoe Furber, Northern States Power Co.

Dean H. Mitchell, president, and C. S. Stackpole, managing director, AGA, brought mesages from the national association.

Scott succeeds Johnstone as PCGA managing director

Robert D. Scott, at present vice president in charge of sales of Honolulu Gas Co., has been named to succeed Clifford Johnstone as managing director of the Pacific Coast Gas Association.

Mr. Johnstone, who became eligible for retirement early last year, is the first full-time managing director the PCGA ever had, and has served in that post for more than 30 years.

Mr. Scott was a salesman for Pacific Gas & Electric Co. when that company was merchandising; he has had extensive experience in the Northwest as a part of the organization of the Natural Gas Corp. of Oregon and Washington. After the liquidation of those companies, he purchased and operated the property at Anacortes, Wash.

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Dependable
Mobile

GO-FOR-DIGGER
For Digging Distribution & Service Lines

Six years of successful selling to Utilities prove GO-FOR-DIGGER's acceptance.

PROFIT BUILDING FEATURES

- One operator controls all phases of GO-FOR-DIGGER digging.
- Quick-Change Angling Dozer Blade.
- Automatically operated shoe support for digging boom.
- Hydraulically controlled conveyor belt permits dirt deposit on either side of the trench.
- 6 to 15 inch widths and 3 to 5 feet depths.
- Digs up to 300 feet an hour forward — also digs backwards.
- Offsetting digging apparatus shifts hydraulically to far right — permits digging close to fences, buildings, embankments, etc.

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GAS news

Edison Co. wants more gas from California utilities

Southern California Edison Co. has appealed to the California Public Utilities Commission in an attempt to force gas companies to sell it more natural gas.

The electric utility also has threatened to build its own transmission lines to supply gas to its steam generating plants throughout southern California.

Named as defendants in the action are Southern California Gas Co., Southern Counties Gas Co. and Pacific Lighting Gas Supply Co. These companies now supply Edison with gas. Edison officials say that they can purchase only enough gas to fulfill 28% of their fuel requirements. The remaining energy is supplied by fuel oil.

One reason for Edison's complaint is believed to be the sudden shortage of fuel oil on the West Coast. The petroleum industry has begun upgrading its products to meet heavy demand for premium aircraft fuel, hence the fuel oil supply has greatly decreased.

Edison President James F. Davenport told the PUC last month that his company had opportunities to purchase supplies of natural gas in California fields but had no way to transmit it. He urged the PUC to direct the gas companies to provide such transmission by "exchange service." Under this plan Edison would turn over to the gas companies any supplies of gas it might acquire in exchange for an equal amount delivered where it is most needed by the electric utility.

Another reason for Edison's desire to acquire more gas supplies, the PUC was told, was the company's eagerness to help curb air pollution. Fuel oil contributes 80% more smog than does natural gas, the company testified by citing a Los Angeles County Air Pollution Control District finding. The Edison Co. generating plants have been a prime target for anti-smog critics during recent years.

Edison officials testified that other electric companies in southern California receive from 60 to 78% of their

If this Housing ever Breaks or Distorts we will replace it Free.
THE RIDGE TOOL CO. ELYRIA, O.

Even *without* this famous guarantee

Genuine
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would still be the
World's Most Popular Pipe Wrench

...and no wonder— millions of users know it *out-performs, out-lasts* all others!

It's the "RIDGID" name that guarantees you everything you want in a pipe wrench — instant bite on the pipe, instant let-go — it can't lock, assured by patented hookjaw suspension . . . handy pipe scale, easy-spin adjusting nut, comfort-grip I-beam handle . . . and every one factory-tested before shipment!

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Always most for your money . . . your Supply House has them!

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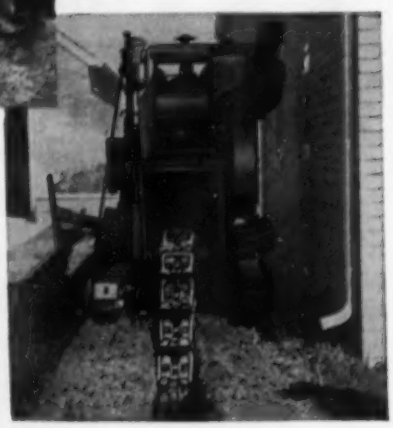
Work-Saver Pipe Tools

The Ridge Tool Company • Elyria, Ohio, U.S.A.

"POW-R-DITCHER IS SUPERIOR FOR SMALL MAINS & SERVICES"

Says "Bud" Somerville and Supt. Jim Godwin of the
SOMERVILLE CONSTRUCTION CO., Ada, Michigan

"We have used several makes of ditchers and find the Vermeer 4T POW-R-DITCHER superior for installation of small gas mains and services. We get more footage with less destruction to landscaping. Our experience in this type of work covers a 15 year period and a great variety of ground conditions."



VERMEER 4T POW-R-DITCHER COSTS LESS . . . DIGS FOR LESS

This Vermeer "Midget Ditcher" is just the machine for laying gas pipe, service lines and digging foundation footings. Only 42" wide 6' high, 13' long. Digs 6" to 14" wide and can be transported in a pick-up truck. Same size moving parts as larger models. Write for name of distributor and full information on the complete POW-R-DITCHER line.

Some Excellent Sales Territory Available

VERMEER MFG. CO., Pella, Iowa

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Gas Systems made safer with

GAS LEAKAGE SURVEYS

#1. Vegetation
#2. Safety
#3. Combination

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Let us account for your "Unaccounted-for"

Koenig ALL-STEEL CABS for JEEPS

FULL AND HALF CABS

Full Cab and Model 131J King Winch Illustrated

- Protection
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- Safety
- Convenience

Roll-down windows, full opening . . . full panel-board head lining and masonite door lining . . . safety glass throughout . . . all-steel welded construction . . . door locks.

KING WINCHES

King Winch on R-140 and R-160 Internationals

There's a front-mount King Winch designed to fit your specific needs . . . for ½-ton through 2½-ton trucks . . . pulling capacities of 8,000 to 19,000 lbs.

P.T.O.-driven King Winch on Willys Jeep

FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS.

Power-take-off-driven King Winch models 130J and 131J for CJ-3B and older-model Jeeps, can be transferred to CJ-5 and CJ-6 Jeeps . . . nothing extra needed.

Koenig cabs and King Winches for Willys vehicles available through all Willys Motors, Inc., dealers and distributors in U.S.A. . . . and Willys-Overland Export Corp. distributors in other countries.

Koenig IRON WORKS, INC.

2200 WASHINGTON AVENUE, HOUSTON 10, TEXAS

news • *Continued*

total fuel requirements from gas companies. Edison Co. gets only 28%, the PUC was told.

The three gas companies named as defendants will reply to the charges in a hearing before the PUC June 13 and 14, in Los Angeles.

Officials of SoCal, Southern Counties and Pacific Lighting maintain that their prime responsibility is to provide adequate and uninterrupted service for residential customers and those smaller industrial establishments that do not have alternate fuel systems available. They say that an increase in supplies to Edison Co. generating plants would force drastic reductions in service to other customers.

Officials of the three companies point out that they are primarily engaged in distribution, not transmission. Therefore, their systems are not designed, or intended, to be used for bulk transportation as Edison seeks in its exchange proposal now before the PUC.

Corrosion from all angles to be covered by course

A wide range of subject matter is included in the program for the first Appalachian underground corrosion short course scheduled for West Virginia University at Morgantown on June 11-13.

A partial list of subjects to be covered at the three-day session includes fundamentals of corrosion, demonstration of the theory of cathodic protection, test methods used by manufacturers in determining coating specification, magnesium anode installation, electrolysis reverse current switches, fundamental analysis of stray current corrosion, field application of hot applied coating, specifications for expendable anodes, plastic piping for underground service, glass fiber as a reinforcement for pipeline enamels, design and backfill for magnesium anodes, and survey of well casing corrosion.

Copies of the complete program, which includes information on available housing and other details, are available from R. E. Hanna Jr., Department of Extension of Industrial Science, Morgantown, W. Va.

New law puts Mississippi utilities under PSC control

Mississippi's public utility regulatory law has been revised by a bill that brings natural gas and electric utilities under control of the state PSC. Final passage was given last month by the Mississippi legislature.

The measure, which had not yet been signed by Governor Coleman, provides for a change from the fixing of utility rates on the basis of a fair return on original investment to a fair return on "reproduction costs new" or so-called fair value rate base.

Utilities denied rate increases by the PSC will be permitted by the act to put such increases into effect under bond pending outcome of appeals.

Right of municipalities to grant franchises to public utilities is retained by the bill. The bill also provides for payment to municipalities of 2% of the gross receipts of gas and electric companies within the limits of a municipality.

The act stipulates that "any muncipality shall have the right to acquire by purchase, negotiation or condemnation the facilities of any utility that is now or may hereafter be located within the corporate limits of such municipality."

Heating installations top 1.4 million in '55

More than 1.4 million househeating installations were added by the gas utility industry during the 1955-1956 heating season, and more than 3.8 million new installations are anticipated during the next three heating seasons, according to an AGA report. By December 1958 the total number of gas-heated homes will reach 19.2 million. At the end of 1955 there were 15.4 million homes heated by gas, equivalent to 57.5% of all residential gas customers.

Significant is the fact that existing househeating customers represented 69.2% of all residential users considered to be part of the potential market for gas heating.

The East North Central states will show the most significant gains during the next three heating seasons, where approximately 1,035,000 customers will be added. This would represent a gain of about 38% in heating customers in that area for the three years. In the Middle Atlantic states, additions of 490,000 gas househeating customers are expected during this same period, increasing heating customers by 28%. New gas heating installations in the New England area will aggregate 134,000 units, an increase of 85% over the 158,000 homes presently gas-heated in this region.

New home construction during the next three heating seasons will account for 62% of the new gas heating installations, with the remainder representing conversions of existing homes. Anticipated continuation of high new construction levels holds promise for the

Next job is only *minutes* away with rubber-tired Trenchmobile®

Mobility on rubber is the answer to widely-scattered trenching jobs around town, and in outlying suburban areas. A job 6 miles away can be started in less than 30 minutes from "now", with a Parsons Trenchmobile. This mobile, rubber-tired trencher runs anywhere at a moment's notice. It drives cross-town, through traffic at 12.6 m.p.h. — digs the trench at speeds up to 14½ feet per minute — drives on to next job. No waiting for trailer — no loading or unloading delays.

Digs 8 to 16 inches wide

Trenchmobile maintains fast "work-and-run" schedules on residential service connections, does pipe reclamation, trouble-shooting — is big enough, too, for main line extensions. You get trench widths from 8 to 16 inches — depths to 5 feet.

Positive down-crowd boom starts cut fast, maintains accurate grade. Self-sharpening "Tap-In" teeth assure top digging efficiency at every depth, width, and in all soil conditions. Hinged crumber sweeps trench bottom clean, ready for pipe. Sloping ladder boom also undercuts walks, curbs, gutters, cross-pipes — makes vertical set-ins. Shiftable, reversible conveyor places spoil bank on either side of trench — lets you work close to buildings, poles, without swerving from grade line.

Backfills its own trench

With 6-foot backfill blade (optional) Trenchmobile does many jobs with one-man, one-machine economy. Better see your Parsons distributor about it, or write us today. Also check Parsons 5 big, crawler-mounted Trenchliners®.

P553 GAS

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Send us latest bulletin on rubber-tired 88 Trenchmobile.

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maintenance of significant new additions to gas heating customers. Conversions from other forms of heating continue substantially to exceed new home installations in both New England and East North Central regions.

As of Oct. 31, 1955, there were 72 utilities, serving 6.7 million residential customers (equivalent to about 25% of all households served by the gas industry) which still had in effect some restrictions of new heating installations. Two years ago there were 88 utilities, serving 9.1 million families who were in a similar position. Increasing supplies of gas and greater utilization of underground storage facilities have been responsible for this improvement. It is expected that the frequency of restrictions will be further reduced in the near future.

Texas high court orders retrial of rate case

The Texas supreme court has reversed a trial court ruling in a suit challenging the railroad commission's system of determining city gas rates.

The high court ordered retrial of a suit brought by the Houston Natural Gas Corp. against the commission in connection with a commission ruling on gas rates for the city of Alvin.

Houston Natural appealed to the commission from an Alvin city council order rejecting a rate boost. Austin District Judge Roberts ruled in favor of the gas company and issued a permanent injunction against enforcement of the commission's rate order.

Arkansas governor urges rate study by outsider

Arkansas' Governor Faubus has advocated retention of an "outside" expert to make a cost-of-service study of the Arkansas Power & Light Co.

A study of how much it costs to serve the various classes of customers was ordered by the Arkansas PSC when it dismissed the company's application for higher rates. The commission directed, however, that the study be made jointly by its staff and the company.

Believing that the people would be better satisfied with an outside study, the governor declared he would be willing to have the PSC use part of its appropriation to employ an expert not connected with the commission or the company to make the investigation.

Mrs. America to be selected this month

Top homemakers from the 48 states and the District of Columbia will compete in the 18th annual Mrs. America contest at Ellinor Village in Daytona Beach, Fla., early this month.

All 49 finalists will have been selected as top homemakers in their respective states as a result of contests by AGA member companies, and daily newspapers, and television and radio stations. The annual competition is sponsored by the AGA in conjunction with the City of Daytona Beach, Ellinor Village, and a host of participating companies, including the range division of GAMA, Robertshaw-Fulton Controls Co., Servel, and John Wood Co.

During the six-day competition at Ellinor Village, each state finalist and her husband will take up living quarters in an individual gas-equipped villa along Mrs. America drive. Here each will be required to cook, prepare meals, sew, iron, and in other way demonstrate her homemaking ability in quest of the title.

The homemaker chosen by the national board of judges, which includes the nation's outstanding home ecomists, will receive $15,000 in prizes, including a New Freedom Gas Kitchen and

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It will instantly locate all subsurface pipes, cables and such, and determine their depth too. The etched circuitry, our latest innovation, assures better quality control and performance than the customary hand wiring method. You can avoid damaged structures and loss of time with the Wilkinson Line Locator.

The new loop antenna is designed for greater selectivity and the printed circuitry eliminates the usual variations. These improvements make this instrument outstanding.

Our instrument cases are now made with wear resisting phenolic material.

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Laundry featuring the Mrs. America kitchen, a 1956 car, and a trip to Europe and the Belgian Congo for herself and husband.

Webster's school-like meeting attracts 125 men

L. S. Reagan

The 10th annual sales and engineering conference of Webster Engineering Co., held in Tulsa recently, attracted approximately 125 industrial engineers of gas companies, architects, engineers, and sales agents from the U. S. and Canada.

L. S. Reagan, vice president and general manager, and G. C. Bergtholdt, chief engineer, led off the school-like conference with an instruction course on "Basic Combustion Engineering." Mr. Reagan also presided over an open forum on the subject of oil systems. Oil systems in relation to combination gas and oil burners were discussed by Fred Ravensbeck, Rayfield Staffco Oil Burner Co., and George Westmont, Wisconsin Oil Burner Co.

Others on the program were Robin A. Bell, vice president and general manager, Janitrol division, Surface Combustion Corp., who discussed business trends and the sales outlook for 1956; Mr. Bergtholdt, who described the Webster burner line; Jack Lacy, sales training executive, who presented a film demonstrating the elements of salesmanship; and K. S. Jaeger, Webster's assistant chief engineer, who discussed the new manual prepared by the company dealing with proper sizing and selection of valves.

Seven-state area hit by unified promotion

One of the gas industry's largest unified promotions of the year was launched last month by 12 utilities serving 1.75 million residential customers in a seven-state area.

Cooperating in the 1956 Spring Matchless Gas Range campaign are 10 gas range manufacturers, each of whom will benefit from a full week of exclusive promotion.

Sponsoring the campaign are Equitable Gas Co. and Peoples Natural Gas Co., both of Pittsburgh, and all companies of the Columbia Gas System, including United Fuel Gas, Amere Gas Utilities, Central Kentucky Natural,

ONLY PEERLESS OFFERS MORE ATTRACTIVE FEATURES FOR GREATER SALES IN GAS HEATING

Easiest-to-sell . . . smartest contemporary styling . . . stays sold . . . trouble free operation . . . durable easy-to-clean finish . . . inside easy to clean . . . comfort . . . safety . . . clean even heat . . . rugged construction . . . economy, low operating cost . . . thoroughly engineered . . . warmer floors assured. The Top Quality Console Heater line for everybody's purse. Consistently the best for over 70 years . . . a better buy than all the rest.

Sell the whole PEERLESS line — reap the whole profit. A size and style for every need.

Peerless GAS CONSOLE HEATERS

PEERLESS MANUFACTURING CORPORATION LOUISVILLE 10, KY.

-it's easy when you know how!

And much of the know-how is in using DELAWARE PipeDrivR tools. No more need to use costly makeshift tools. DELAWARE has engineered and field tested a complete set of accessory tools for every pipe driving operation. No threaded parts to jam, no pins to shear off . . . mill wrap is fully protected against stripping. Made from DELSTEEL ALLOY, the DELAWARE PipeDrivR tools are designed to take the toughest service. Big savings in time and cost are yours with dependable DELAWARE tools.

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APPLIANCE SERVICING EQUIPT.

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TAMPA, FLORIDA

Virginia Gas Distribution, Manufacturers Light & Heat, Cumberland & Allegheny Gas, Binghamton Gas, Keystone Gas, Ohio Fuel, and Natural Gas Co. of West Virginia..

More than a million lines of newspaper advertising will be run in 71 daily and 196 weekly papers during the 10-week period, which ends June 16. Heavy television and radio advertising schedules will center around programs already sponsored by the gas utility companies in their various areas. The campaign will cover substantial portions of Kentucky, Maryland, New York, Ohio, West Virginia, western Pennsylvania, and Virginia.

More than $43,000 work of prizes will be poured into a dealer-salesman contest. Participating dealers are being provided with complete point-of-sale display packages, emphasizing the Matchless theme. A total of 67 dealer contact men, employed by the utilities, are visiting dealers to stimulate interest.

Rockwell enters new field with recent acquisition

Rockwell Manufacturing Co. has acquired the assets of a Kansas company which claims the largest steel foundry and machine shop facilities west of the Mississippi.

Locomotive Finished Materials Co. of Atchison is the largest Rockwell acquisition since the purchase of Delta Manufacturing Co. 11 years ago. LFM will continue under its present management as a major division of Rockwell. The newly acquired company has close to half a million square feet of production facilities in Atchison and in St. Joseph, Mo. It casts, machines, and assembles a large volume of equipment for the petroleum industry, as well as for the railroad, machine tool, mining, power, and other industries.

The acquisition marks Rockwell's entry into the business of producing such items as special machinery of complex heavy design, rock-crushing machinery, centrifugal pumps, and oil field and power plant equipment.

Fifth management workshop scheduled

The fifth annual Utility Management Workshop, operated by the Department of Industrial and Management Engineering of Columbia University, will be based on the theme "What managers do and how they do it." The workshop is scheduled for July 29-Aug. 10 at Arden House, Harriman, N. Y.

Approximately 40 specially selected top management executives will live and work together to solve pertinent problems of modern management posed by the university staff. Participants work in small task-force groups applying their own experience and knowledge to the problems set forth.

The workshop is under the direction of Prof. Robert Teviot Livingston, consultant for the Long Island Lighting Co. and administrative research consultant for Columbia's Teachers College. Participation in the workshop is open to nominees from private gas, electric, telephone and pipeline companies as well as airlines, railroads and other transportation companies.

Cascade's construction program gets under way

Construction schedules involving installation of more than 400 miles of mains and nearly 800 miles of customer service lines in its Washington service area were kicked off last month by Cascade Natural Gas Corp.

Six hundred men will be employed

Rockwell's newly acquired steel foundry and machine shop facilities in Atchison, Kan., reportedly the largest such installation west of the Mississippi.

in building new distribution systems costing $11.6 million. That amount, which will be spent between April 1 and early next fall, includes cost of pipe, construction costs, and other materials.

"Construction of mains will be completed within three to four months on each job," Stewart Matthews, president of the Seattle company, reports. "Installation of service pipes will be a continuing program as new customers are added. . . ."

Barton Instrument breaks ground for new plant

Barton Instrument Corp. broke ground recently for a new $200,000 plant in Monterey Park, Calif.

Situated in Monterey Park's new industrial center, the 30,000-sq ft plant plant will be of concrete slab, tilt-up construction, without windows or skylights. It will be completely air conditioned.

Barton Instrument, headed by Barton Jones, president, manufactures flow meters and allied instruments for the oil field and petrochemical industries. It has geared its plant and office to meet increasing demands for greater production.

Consumers Gas of Toronto expands Ontario operations

Consumer's Gas Co. of Toronto, Canada, has purchased the propane air plant and distribution facilities of the Ontario Shore Gas Co., which serves Oshawa, Whitby and Bowmanville.

Completion of the transaction culminates drawn-out litigation between Ontario Shore and the Merchants' Gas Co. of Toronto, which earlier had been negotiating for the purchase of the Oshawa company.

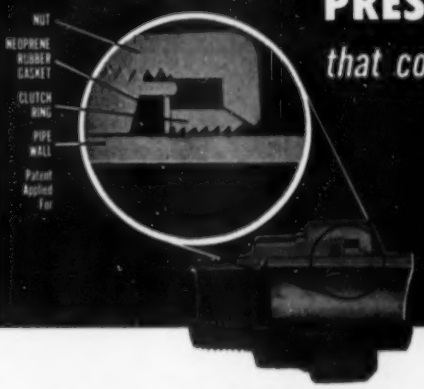
Consumers Gas will convert the propane air system and customers appliances to natural gas by the fall of this year. Gas will be supplied by a line from Toronto to the Oshawa, Ajax, Whitby, and Bowmanville areas.

Oakah L. Jones, vice president and general manager of Consumers, said operation of the utility would be handled from offices in each of the communities.

Gas and the atom subject of AGA booklet

Latest available scientific and engineering information indicates that in the foreseeable future, atomic energy will supplement but not supplant gas,

Telsco. the tight-sealing
PRESSURE FITTING
that conducts electricity



Telsco Long and Short Couplings, Adapters, 90° Elbows, and Tees, ½ through 2 inches.

Use Telsco Fittings on Plastic Pipe, too—Metal Stiffeners for this application are available.

The unique sealing principle used in Telsco Threadless Fittings concentrates great pressure, under containment, on *all sides* of a *small* rubber gasket (See cross section). Under this tremendous pressure, confined in a small area, the gasket forms a tight seal against leaks.

At the factory every Telsco Fitting gets a 90-pound air pressure test, under water—assuring a sound casting every time.

Telsco Fittings do not insulate. Instead they conduct static electricity without the time, effort and cost of bonding every connection.

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FROM THE WORLD'S FINEST DETECTION EQUIPMENT MANUFACTURERS

You Need a GOLDAK MODEL 87 PIPE LOCATOR

No need for heavier, bulkier locators — Goldak Model 87 is a "Giant in Action" . . . accurately measures depth of Pipes and Cables. One man operation! Economical! Tubes, Batteries and Parts easily replaceable! Comes complete, ready to use.

The GOLDAK Company
Leading Electronic Manufacturers
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IF YOU CUT LARGE DIAMETER PIPE . . .
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.

Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

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Be Completely Insured!
RELY ON
NEW ENGLAND FORESTRY SERVICE

the complete
Gas
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NEW ENGLAND FORESTRY SERVICE, INC.
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*Originator of
Vegetation Surveys
for Gas Companies in 1934

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INSULATED
METER NUTS

QUICK INSTALLATION!
POSITIVE INSULATION!
LABOR SAVING!

Gas never touches nylon liner . . . gasket holds pressure. Installation in less than five minutes with no repiping required. Sizes for all iron or tin meters with swivels ½" to 2" pipe sizes, inclusive. Write for bulletin 522.

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P. O. BOX 13122 WALNUT HILL STA.
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oil and coal, the AGA reports in its new booklet, "Gas and the Atom."

The booklet answers 18 commonly asked questions on the subject of atomic energy. It reveals that two independent groups of scientists anticipate a 50% increase in total U. S. energy needs during the next 20 years, and atomic energy will help supply this increased demand.

Radioisotopes, a by-product of atomic energy production, are already proving useful to both the gas and oil industries, the booklet points out.

Pennsylvania bill awaits senate action

Under an amended bill, Pennsylvania's PUC would be forced to hold hearings only when proposed rate increases amount to 1% of a utility's total revenue, or if the increases will boost the annual cost of service to 5% or more of the company's customers.

The bill, which has been passed by the Pennsylvania house and sent to the senate, is a watered-down form of a measure which would have required public hearings in all rate change cases.

Another change in the bill as approved by the house would authorize the commission to suspend any rate increase for up to one year. At present the maximum is an original suspension of nine months and an additional three-month suspension if needed to complete the investigation.

A third change in the original bill would have the PUC, upon deciding a proposed tariff is unlawful, determine the lawful rates and fix them by order. At present the utility itself revises its proposed rate changes if the PUC has turned down the entire increase.

The bill contained no mention of the fair-value determination. Fair value is presently figured at somewhere between original cost and the cost of replacement at current costs, less depreciation.

Limit on court evidence proposed in Indiana

Evidence presented by Indiana utilities in court appeals on rate cases may be limited to that which was presented before the Public Service Commission.

Chairman Buchanan of the Indiana PSC said it is likely that a bill will be introduced in the 1957 Indiana legislature to tighten the state utility regulatory law.

The chairman, in criticizing tactics of Public Service Co. of Indiana, contended that the utility made a weak case before the PSC to invite a hostile

USE KA-MO DRILLS

FOR A BETTER–FASTER MORE PROFITABLE JOB

8" KA-MO boring bit was equipped with wing cutters to produce a 9" bore to accommodate 8" casing.

These photos were taken at a job where it was necessary to drill under a highway to supply gas to a nearby town. A KA-MO drill gobbled up a core of dirt 9" in diameter and 112' long. Moving at a rate of 8" to 12" per minute, the KA-MO Auger completed the bore within a matter of hours without interruption of traffic.

HORIZONTAL BORING

FOR — water, sewer, oil and gas pipe lines — gas and electric services.
UNDER — highways — railroad beds — streets — alleys — lawns. With or without casing. With no interruption of traffic.

VERTICAL BORING

FOR — locating gas leaks — telephone, telegraph and power poles — elevator shafts — pre-bore for piling — drainage installations — foundations — soil testing.

ANGULAR BORING

FOR — anchor holes — batter piling, etc.
DRILLS THRU — hardpan, clay, shale, other mineral formations and frost.

EASY TO SET UP • PORTABLE • EASY TO OPERATE

POWERED BY			
AIR	HYDRAULIC	ELECTRIC	GASOLINE
4 H.P. to 18 H.P. or in dual or triple drives to 45 H.P.	11.6 to 50 H.P.	1.9 H.P. to 100 H.P.	Engine Drive

DRILL SIZES—2½" to 48" diameter and lengths to meet your needs.

WRITE TODAY — LET US TELL YOU HOW WE CAN REDUCE YOUR DRILLING COSTS

KA-MO TOOLS, INC.
EARTH BORING EQUIPMENT
1845 SOUTH 55th AVE. • CICERO 50, ILL.

QUALITY PRODUCTS
JOHN WOOD
SINCE 1867
For QUALITY and SERVICE
Glass-lined or Galvanized
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JOHN WOOD Automatic Gas Water Heaters are highest-quality heaters, known for their dependable, trouble-free performance. Nationally advertised. Fully warranted. A wide variety of sizes, models, and prices to meet any sales situation.
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Made and warranted by one of the country's oldest, most reliable water heater manufacturers. Conshohocken, Penna. and Chicago, Ill. Approved by the American Gas Association and endorsed by Mrs. America®.

decision which it then appealed to a county circuit court. In court, he charged, the company reversed its tactics and put up a strong case, submitting evidence it withheld from the PSC.

Buchanan said the contemplated new legislation would help protect the function of the PSC as a body designed to assure the people of fair rates.

GAS news notes

The Scranton (Pa.) Spring Brook Water Service Co. will purchase Kingston district properties of United Gas Improvement Co., Philadelphia, for $1 million. The PUC approved the sale after officials of both firms agreed to transfer the UGI plant which furnishes gas service to 10,300 consumers in the county.

General Controls Co., Glendale, Calif., is constructing new facilities in San Francisco which will increase operations in that area by 120%. The new showroom and warehouse will encompass 4400 sq ft with office quarters located on a level above the auto driveway. Test facilities will be provided and service schools and sales meetings will be held in rooms with accordian-type walls that can be adjusted to the size of each group.

Rhodia Inc. has moved into new and larger offices at 60 E. 50th St., New York. The move allows expansion of Rhodia's Aromatics, Alamask and other divisions, and will enable the company to give more rapid handling of customers' requests and orders.

A $50,000 all-gas, Texas Century-of-Progress home that went on display last month in Houston is sponsored by Houston Natural Gas Corp. and more than 50 building firms and suppliers. It is expected that more than 30,000 people will see the 2500-sq ft home during the 23-day showing. Full-page ads in local newspapers will invite the public to the home.

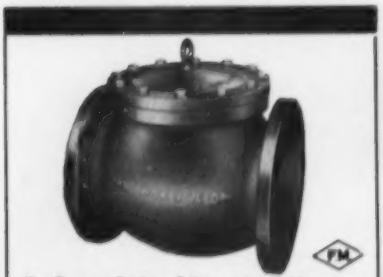
Portland (Ore.) Gas & Coke Co. has filed rate schedules calling for an average decrease of approximately 17.2% to go into effect after natural gas arrives in the Pacific Northwest this summer. According to President Charles H. Gueffroy, new schedules will save present customer $1.7 million a year from the $9.9 million in sales for 1955.

Jetco Sales & Engineering Co., Alhambra, Calif., distributors of Vermeer Pow-R-Ditchers, has appointed the following California dealers: Pringle Tractor Co., Salinas; M.F.D. Inc., San Jose, San Leandro, and Healdsburg; Tractor Specialties Co., Cotati, and Dome Tractor Co., Sacramento.

Michigan Wisconsin Pipe Line Co. has asked for authority to supply gas to 15,151 new househeating customers in Wisconsin. Green Bay, Oshkosh, and Sheboygan would add 2182; Milwaukee, 7367; Racine, 2261; Madison, 1061; Janesville, Beloit, and Fond du Lac, 1297; Appleton, 400; Manitowoc, 523; and Stoughton, 60.

Common sense tips to help the public use gas and gas appliances safely and efficiently are featured in a new pamphlet produced by the public information bureau of the AGA. "Nine Tips on Enjoying Modern Gas Service" gives pointers on ventilation, appliance adjustments, and installation. Additional information on the pamphlet is available from AGA headquarters.

To give recognition to worthy employee ideas, New York State Natural Gas Corp. has formed a "coin your ideas" committee. Appropriate financial rewards will be given to employees who come up with ideas that will benefit both the gas-consuming public and the company. Members of the committee are D. L. Barger, A. R. Blotter, Darwin Whipkey, and Edward Emerson Jr.



A Complete Line In Safety

Approved by FACTORY MUTUAL LABORATORIES

NORWALK DISC TYPE CHECK VALVES

Sizes ½" thru 16"

Manufactured in both horizontal and vertical styles. Designed to give positive check against reverse flow of either gas or air. Especially suited for low pressure distribution systems. Rugged construction with low pressure drop and ease of operation. Our engineers will gladly furnish data for your applications.

SEND FOR FULL PARTICULARS

NORWALK VALVE COMPANY
Railroad Avenue
South Norwalk, Conn.

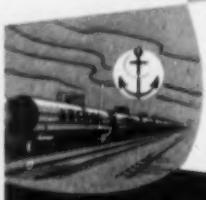
ANCHOR'S BUTANE & PROPANE STAND-BY PLANT PACKAGE

ENGINEERING, INSTALLATION

Anchor's Engineering Dept. will design and supervise plant construction.

FINANCING

Anchor's experienced staff will assist with the financial details..



SUPPLIES

Huge tank car fleet, many plants and vast underground storage assure adequate supplies.

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The Gas Industry Professional Directory

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FOR SALE — OIL GAS PLANT

4 complete 11 ft., three-shell, light oil gas sets, condenser shell, exhausters, cottrells, purifier with Gantry crane, three 10 psi steam-driven compressors, boiler feed water heater, forced draft fans, spare brick shapes, valves and piping.

The Bridgeport Gas Co. • Bridgeport, Conn.

TRANSMISSION • STORAGE • CONDITIONING

GAS

PIPELINE SECTION

ENGINEERING • CONSTRUCTION • MAINTENANCE

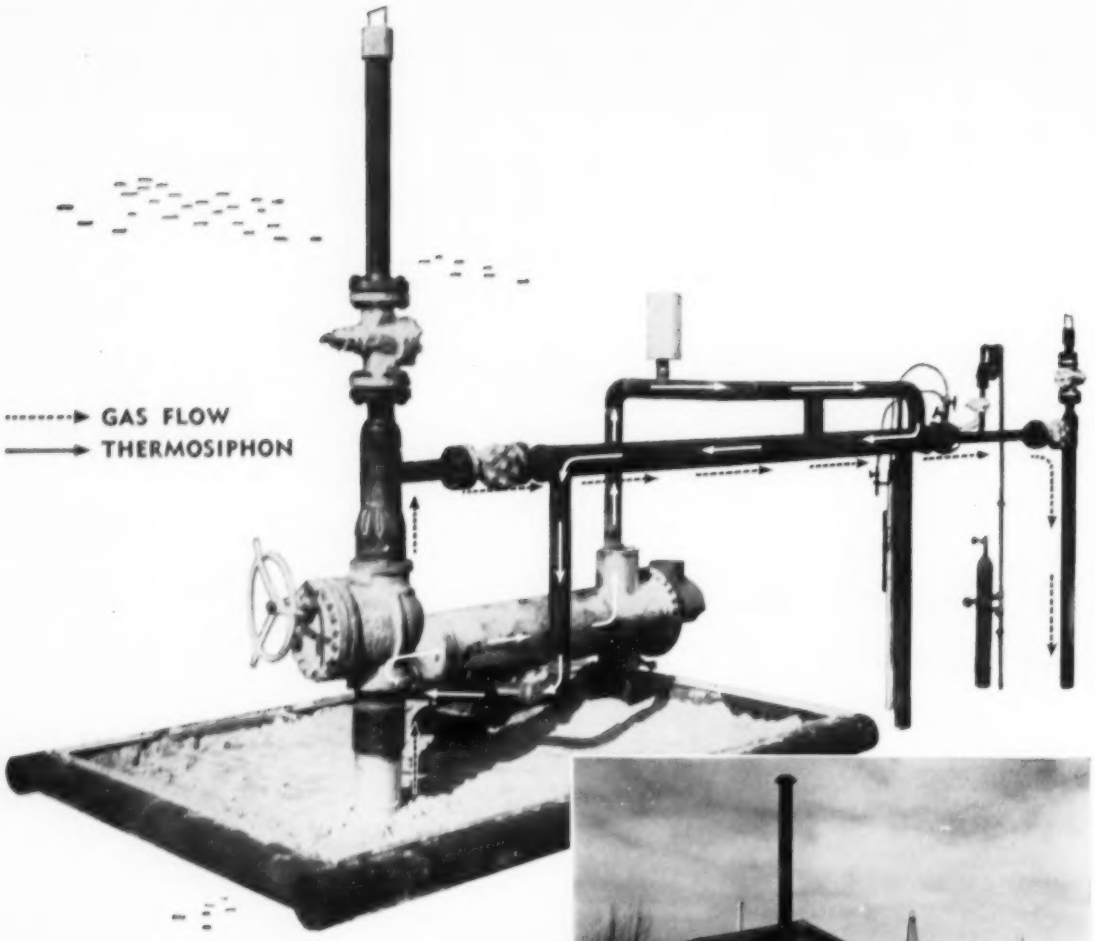
First 2-cycle pipeline compressor with exhaust-powered turbo-charging at all loads . . .

The unique TURBO-UNIFLO has no power draining extra-drive for supercharging from start-up through full load. Individual aftercoolers adjacent each cylinder give maximum load capacity *with* accessibility. Low cycle temperatures reduce maintenance on liners, heads and pistons.

The TURBO-UNIFLO, Worthington's SUTC gas-engine compressor has had remarkable acceptance in its first production year. More than twenty-four are either installed or on order.

Elimination of any mechanically-driven air charging device, and other exclusive design features, make this the quietest 2-cycle engine compressor in the industry. Other *construction* features such as balanced-strain nodular-iron cylinder heads also make this new pipeline unit notable for reliability. For details, write for bulletin S-550-B23D to Section E64.

Worthington Corporation, Harrison, N. J. E-4.4



GAS UTILITY USES 225 NATIONAL HEATERS... SAVES $900 PER MONTH

SITUATION — Underground natural gas storage area in Central Michigan underlying 25 sections of land. Input pressures range from 307# psi to 700# psi. Gas is dehydrated before storage.

PROBLEM — To find a heater

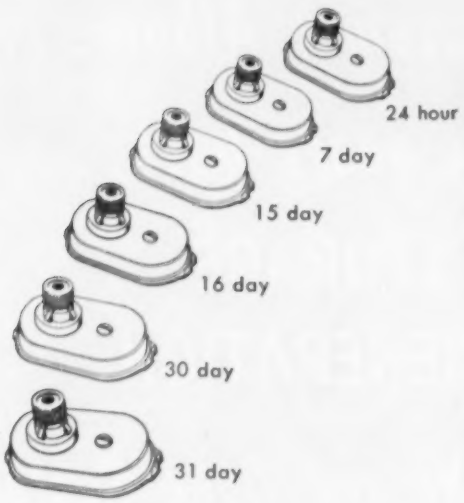
1. That would give a 35 degree temperature rise to a gas stream whose maximum flow would be 500,000 cu. ft. per day.
2. That was small enough to fit in a small house covering both the wellhead and the heater.
3. That would operate at maximum efficiency since all gas consumed in the heater cost approximately 30 cents per thousand cu. ft. at the wellhead.

RESEARCH — Several types of "home-made" and commercial heaters were tried along with National's 16" x 6', Model CA124 Horizontal Heater.

RESULTS — By actual fuel consumption tests, using identical hook-ups, National's heater outperformed all others using exactly one half as much fuel as the competitive models. The gas utility shows a savings of $900.00 per month, based on a 12-month gas expense period. These savings are based on actual tests. They are effected by using 225 National 16" x 6' direct heaters — indirectly — in this one area.

It's National

NATIONAL TANK COMPANY



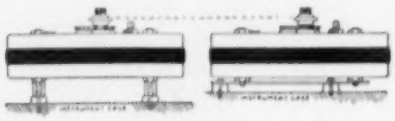
New ROCKWELL
31 DAY CHART DRIVE

For Complete Records Around The Clock

The turret on top does the trick

Stops Estimating Even though your meter man forgets to wind it, this new Rockwell 31 day drive will still provide a complete rotation for the chart period.

Saves Money The six different rotation rates (as illustrated) assure complete flexibility in your measurement program. You'll save through making less trips to the meter; having fewer charts to read.

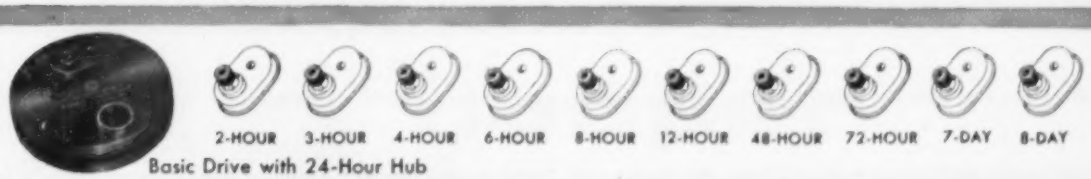


Fits Practically All Instruments The case dimensions are the same as the Rockwell Standard Chart Drive. Simple adaptors, as shown above, permit correctly locating it both as to position and height in practically any instrument.

ROCKWELL MANUFACTURING COMPANY
Instrument Division • Box 2396, Tulsa, Okla.

Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Tex. New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

ALSO STANDARD ROCKWELL CHART DRIVES, 24 Hour Hub, 11 Rotations



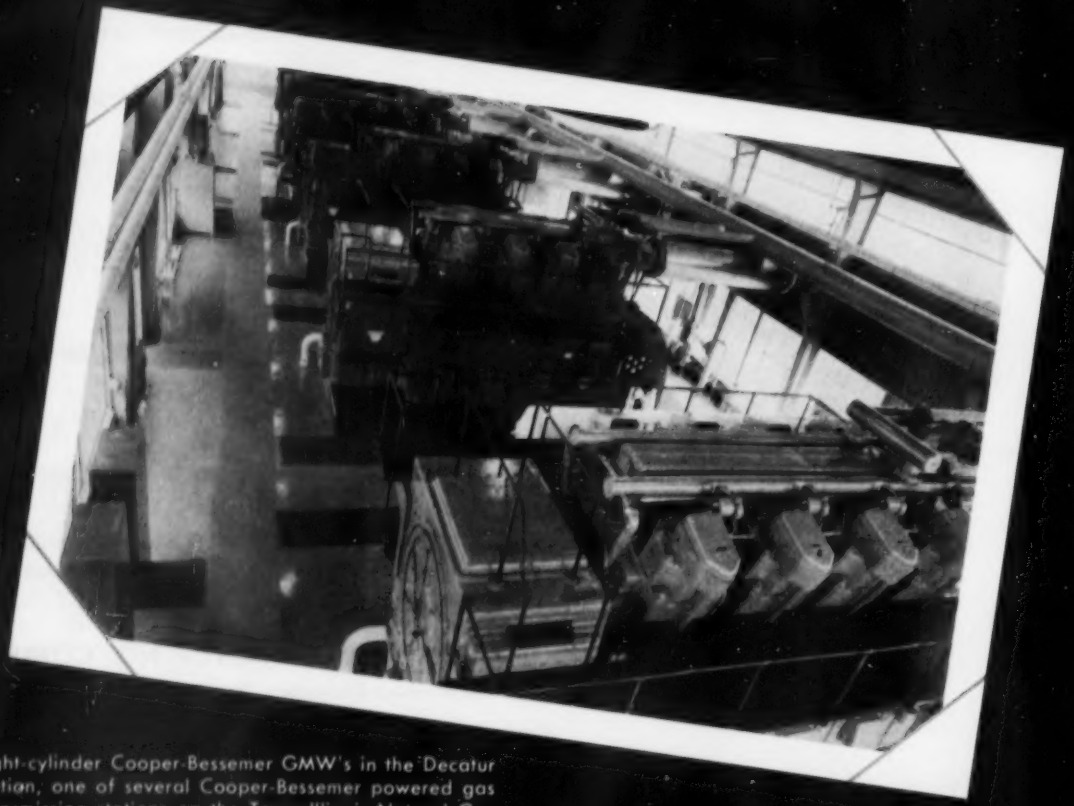
Basic Drive with 24-Hour Hub

From the Cooper-Bessemer Album...

today and thirty-six years past...

TRANSMISSION · STORAGE
DISTRIBUTION · GENERATION

for The Peoples Gas Light and Coke System

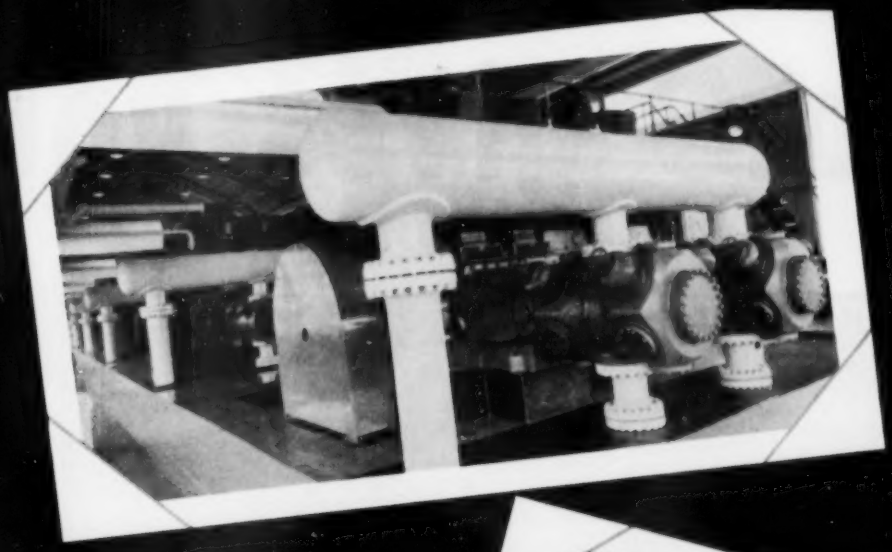


Eight-cylinder Cooper-Bessemer GMW's in the Decatur station, one of several Cooper-Bessemer powered gas transmission stations on the Texas-Illinois Natural Gas Pipe Line Company's line.

ENGINES: GAS • DIESEL • GAS-DIESEL COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE OR MOTOR DRIVEN

BRANCH OFFICES: New York • Chicago • Washington • San Francisco • Los Angeles • Houston • Dallas • Odessa • Pampa • Greggton Seattle • Tulsa • St. Louis • Kansas City • Minneapolis • Gloucester • New Orleans • Shreveport • Great Falls

SUBSIDIARY COMPANIES: COOPER-BESSEMER OF CANADA, LIMITED, Edmonton and Calgary, Alberta • Halifax, N. S.
COOPER-BESSEMER INTERNATIONAL CORP., New York • Caracas, Venezuela • Mexico City, Mex.



Another Example of Efficient Power at Lower Cost

Cooper-Bessemer GMW's in the Natural Gas Storage Company of Illinois' giant Herscher dome storage field. Five engines total 10,000 dependable horsepower.

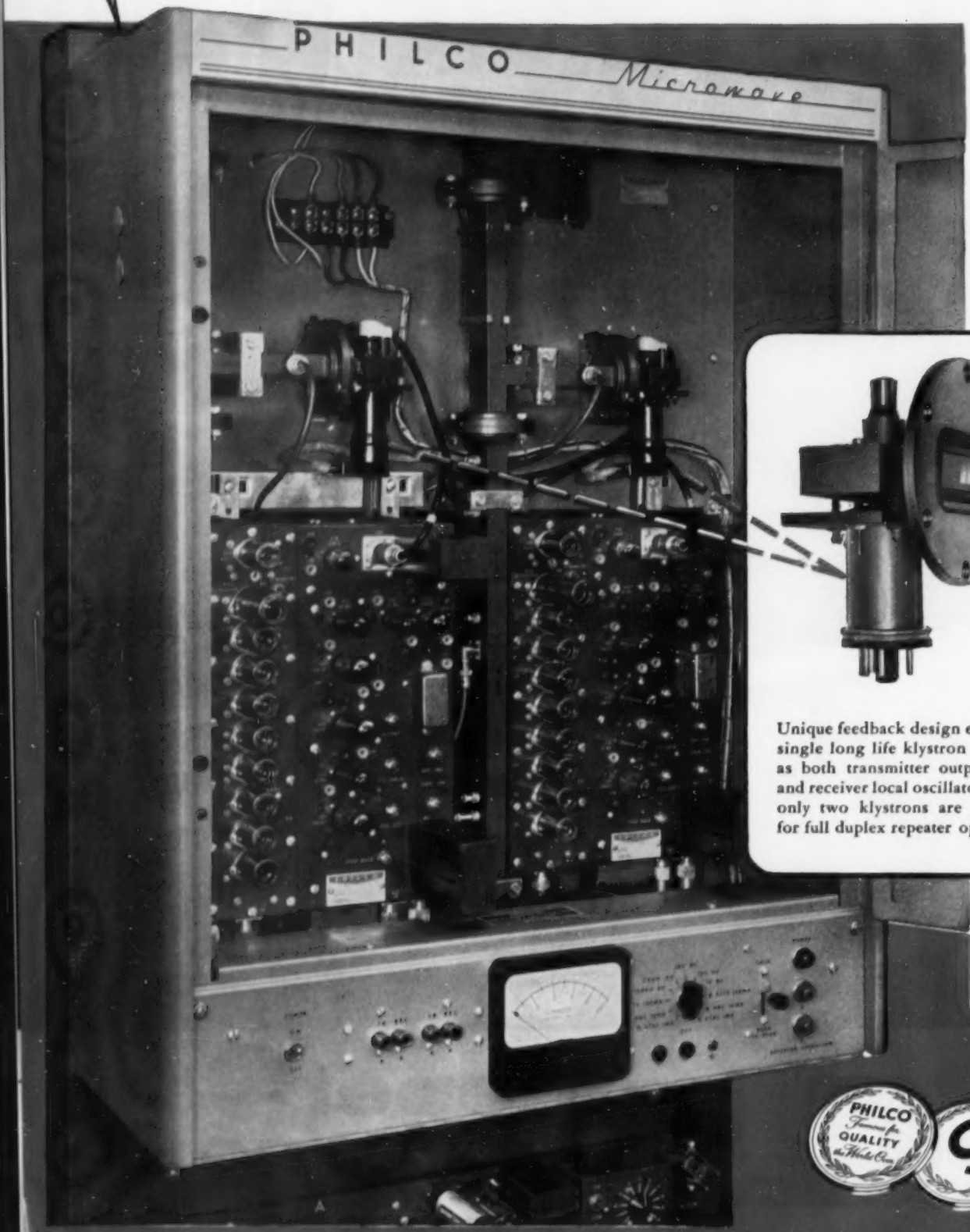
Marshall, Texas . . . one of several Texas-Illinois Natural Gas Pipe Line Company stations equipped with three 8-cylinder Cooper-Bessemer JS gas engines for power generation.

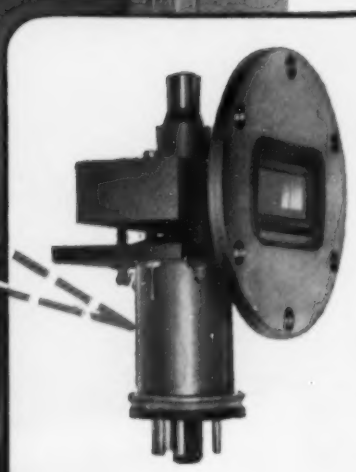
36 years of service and still going strong. Horizontal Cooper-Bessemers are in the transmission and distribution system of the Natural Gas Pipe Line Company of America and in the Peoples Gas Light and Coke Company.

cooper-bessemer

MOUNT VERNON, OHIO • GROVE CITY, PENNA.

PHILCO gives you





Unique feedback design enables a single long life klystron to serve as both transmitter output stage and receiver local oscillator. Thus, only two klystrons are required for full duplex repeater operation.

PHILCO
Famous for
QUALITY
the World Over

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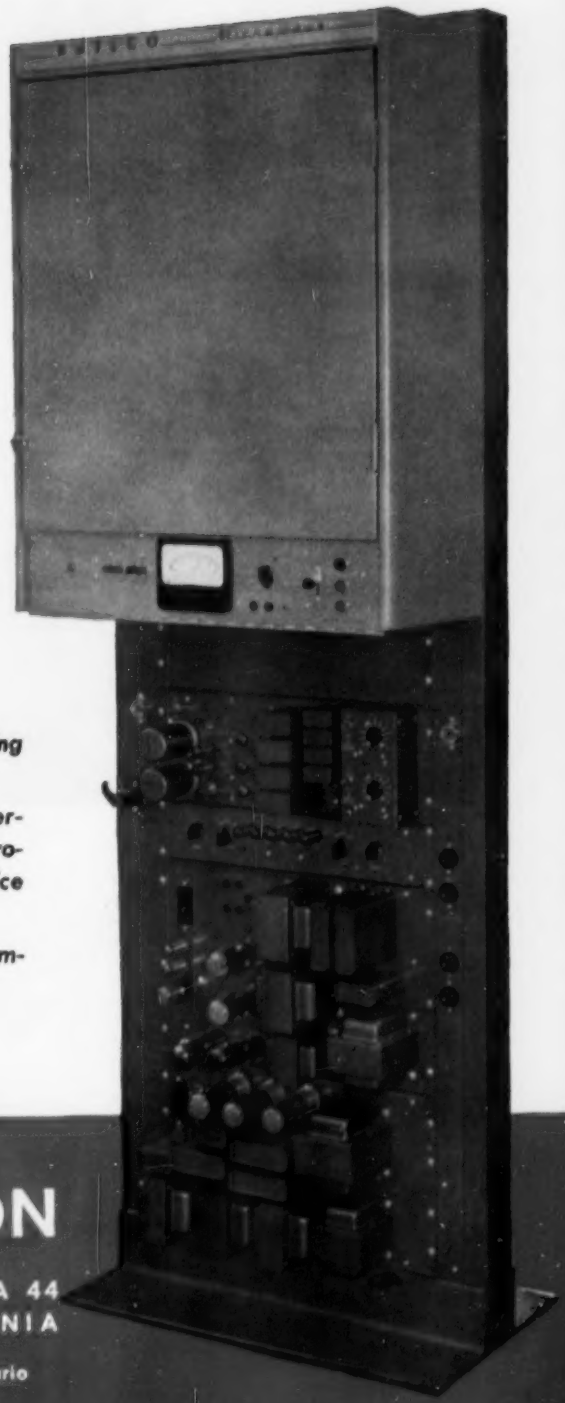
Ten Times More Microwave Power!

PHILCO'S "POWER HOUSE" klystron generates a full watt of power (10,000 watts Effective Radiated Power) in the preferred 6000-8000 mc band . . . provides up to 10db additional safety margin.

Designed specifically for reliable, long distance communications, Philco CLR-7 microwave systems provide high quality communications facilities that accommodate voice, telemetering, supervisory control, teletype, and other forms of data transmission so vital to operations.

Available as a terminal or repeater in Common Carrier, Industrial, and Government bands, Philco CLR-7 microwave provides a degree of reliability never before attained in microwave equipments.

Get complete information on Philco microwave systems. Philco maintains a staff of design, systems, and field engineers experienced and fully qualified to help plan and design your microwave communications system. Write Philco, Dept. G today.



- ★ ***Designed for continuous unattended operation***
- ★ ***Base band available for telemetering and supervisory control . . . teletype***
- ★ ***Centralized system control from terminal stations***
- ★ ***Built in test and metering facilities***
- ★ ***Portable transistorized termination unit provides two-way signalling on service channel***
- ★ ***Conservatively rated components throughout***

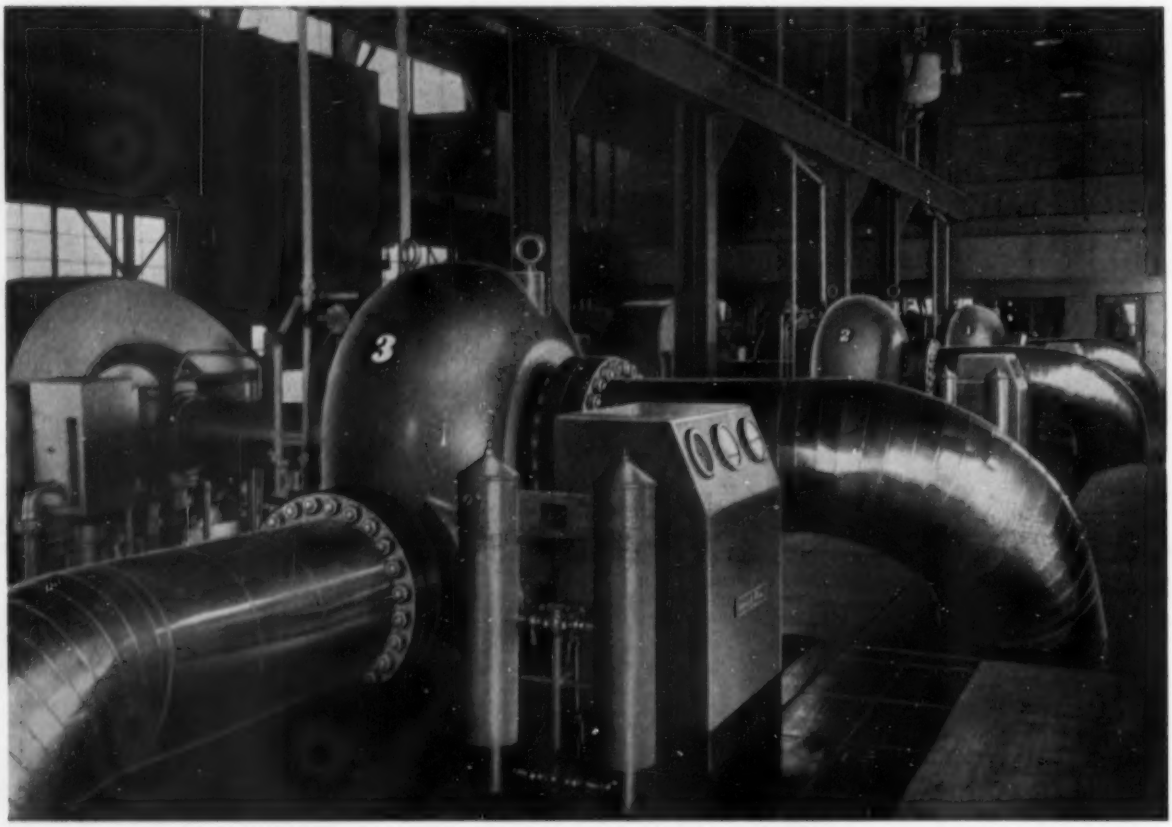
PHILCO CORPORATION

GOVERNMENT AND INDUSTRIAL DIVISION • PHILADELPHIA 44 PENNSYLVANIA

In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

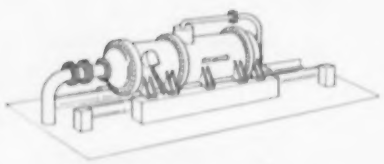
More than 325,000

of I-R CENTRIFUGAL



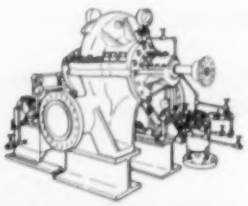
Three of 8 Ingersoll-Rand centrifugal compressors installed on a large natural gas pipe-line. Each unit is driven by a 5000 hp gas turbine.

I-R *"FIRSTS"* in Centrifugal Gas Compressor History



FIRST CENTRIFUGAL PIPE-LINE COMPRESSOR

Built by Ingersoll-Rand in 1931, this centrifugal pipe-line booster consists of a six-stage compressor driven by a 3550 rpm, 3000 hp motor, all encased in a pressure vessel.



FIRST COMMERCIAL APPLICATION

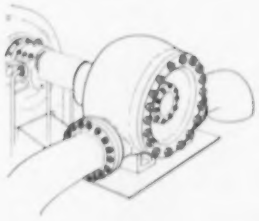
of centrifugal pipe-line compressors was made in 1947. A total of 78 electric-motor-driven, single-stage I-R centrifugals were installed, to handle approximately 250 mmcfd.

horsepower

COMPRESSORS

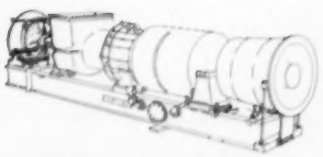
for NATURAL GAS SERVICE

This experience means
MAXIMUM DEPENDABILITY
in modern pipe-line service



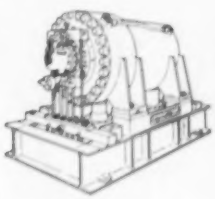
FROM the very first pipe-line installation, Ingersoll-Rand has pioneered in the development of centrifugal gas compressors for higher and higher capacities and pressures. And every step of the way, dependability of performance has been a prime consideration in every detail of design and construction. This is why more I-R Centrifugal Compressors have been sold for natural gas service than any other make . . . a total exceeding 325,000 hp for this service alone.

Backed by such long and successful experience, the modern I-R centrifugal gas compressor is your best assurance of trouble-free performance and long-range economy in gas transmission service.



FIRST GAS-TURBINE-DRIVEN UNIT

Installed in 1949, this Ingersoll-Rand centrifugal compressor, powered by an 1850 hp simple cycle combustion gas turbine, was the first gas-turbine-driven centrifugal compressor developed and applied to pipe-line service, and was designed for a flow of 192 mmcfd at a ratio of 1.18.



FIRST 2000 PSI CENTRIFUGAL GAS COMPRESSOR

This Ingersoll-Rand 5000 hp double-case centrifugal compressor was the first unit ever built for handling natural gas at a discharge pressure of 2000 psi.

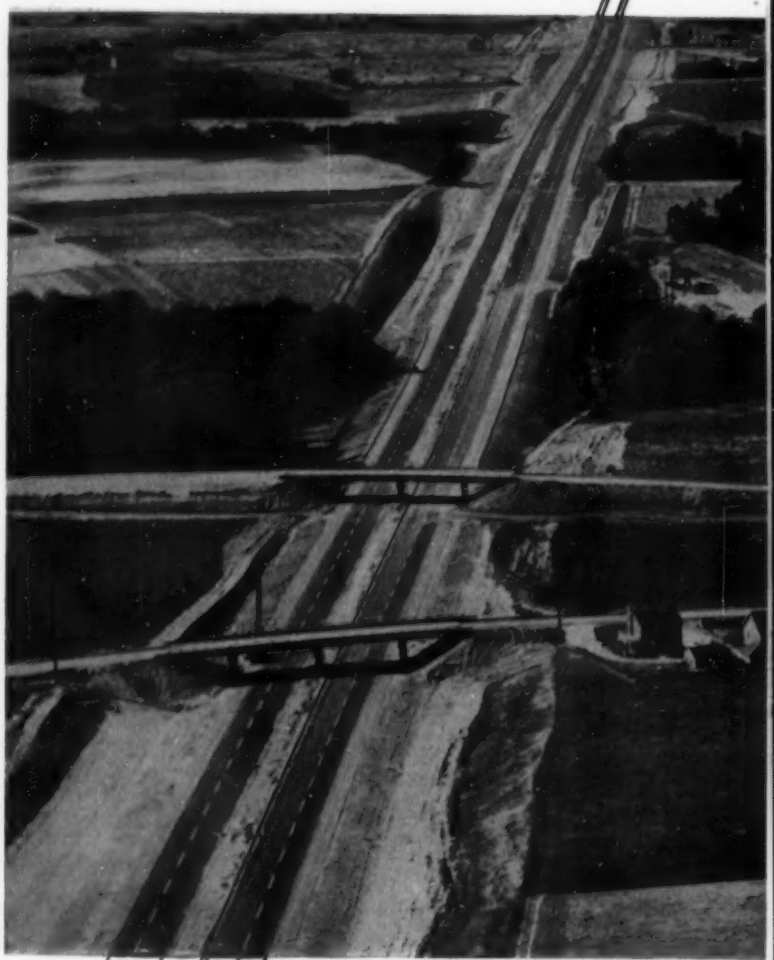
Ingersoll-Rand

11 Broadway, New York 4, New York

12-320

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS
CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

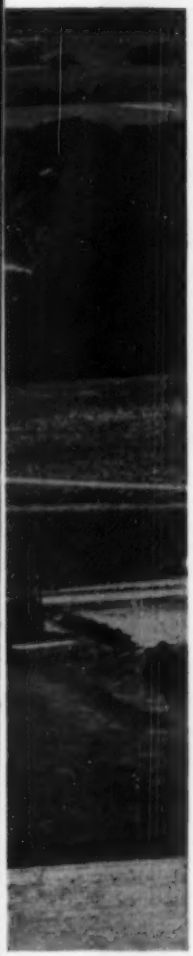
Keeping the



...with RCA 2-Way Radio

RADIO CORPORATION
of AMERICA
Communications Products
CAMDEN, N.J.

Turnpikes *on the beam* means Dependable RCA Microwave



Those high towers you see as you drive along the great turnpikes usually mean that RCA Microwave is on the job providing instant and continuous communication. On the Pennsylvania Turnpike, the New Jersey Turnpike, the Ohio Turnpike . . . wherever the ultimate in dependable communications is required, RCA's performance record, in applications pitted against the toughest service conditions, tells the story of fine performance. A narrow radio beam passing from tower to tower transmits the human voice and operates control circuits. It will carry voice circuits, facsimile, teletype, telemetering, traffic information—all without the weather hazard interruptions, maintenance costs and right-of-way problems of wire lines.

ON PIPELINES—In the petroleum and natural gas industries, where pipelines knife across the country, RCA Microwave Systems link control points and unattended remotely operated booster stations. Pipe line capacity is increased and operating costs are cut. VHF control channels allow immediate contact with maintenance personnel.

IN UTILITIES—In electric utilities, RCA Microwave provides remote supervisory control of substations, load control, and telemetering of voltage and current . . . with 2-way voice channels providing communications between plant and switching stations.

RCA MICROWAVE provides the most advanced engineering features. Provision for the addition of future channels makes it the least expensive form of communication per channel mile. Equipment uses easy-to-service, familiar circuits and readily available tubes. Single side-band suppressed-carrier frequency-division multiplex is used exclusively to meet high standards of dependability. Frequency throughout the entire system is controlled at the terminals only. And only two frequencies are usually required. Furthermore, RCA provides the nationwide services of the RCA Service Company to keep your system operating at its peak.

RCA Microwave Specialists with years of microwave experience will be glad to answer any questions and to assist in planning your installation. Mail coupon for further particulars.

RCA MICROWAVE can interconnect with mobile radio installations as well as with existing telephone lines and switchboards. Patrol and maintenance units can be immediately contacted while driving along the road, saving parking and back-tracking time and preventing costly delays.

RCA MICROWAVE

POINT-TO-POINT COMMUNICATION

Radio Corporation of America
Communications Products, Dept. D-91
Building 15-1, Camden, N.J.

☐ Please send me latest literature on RCA Microwave.

Name_____ Title_____

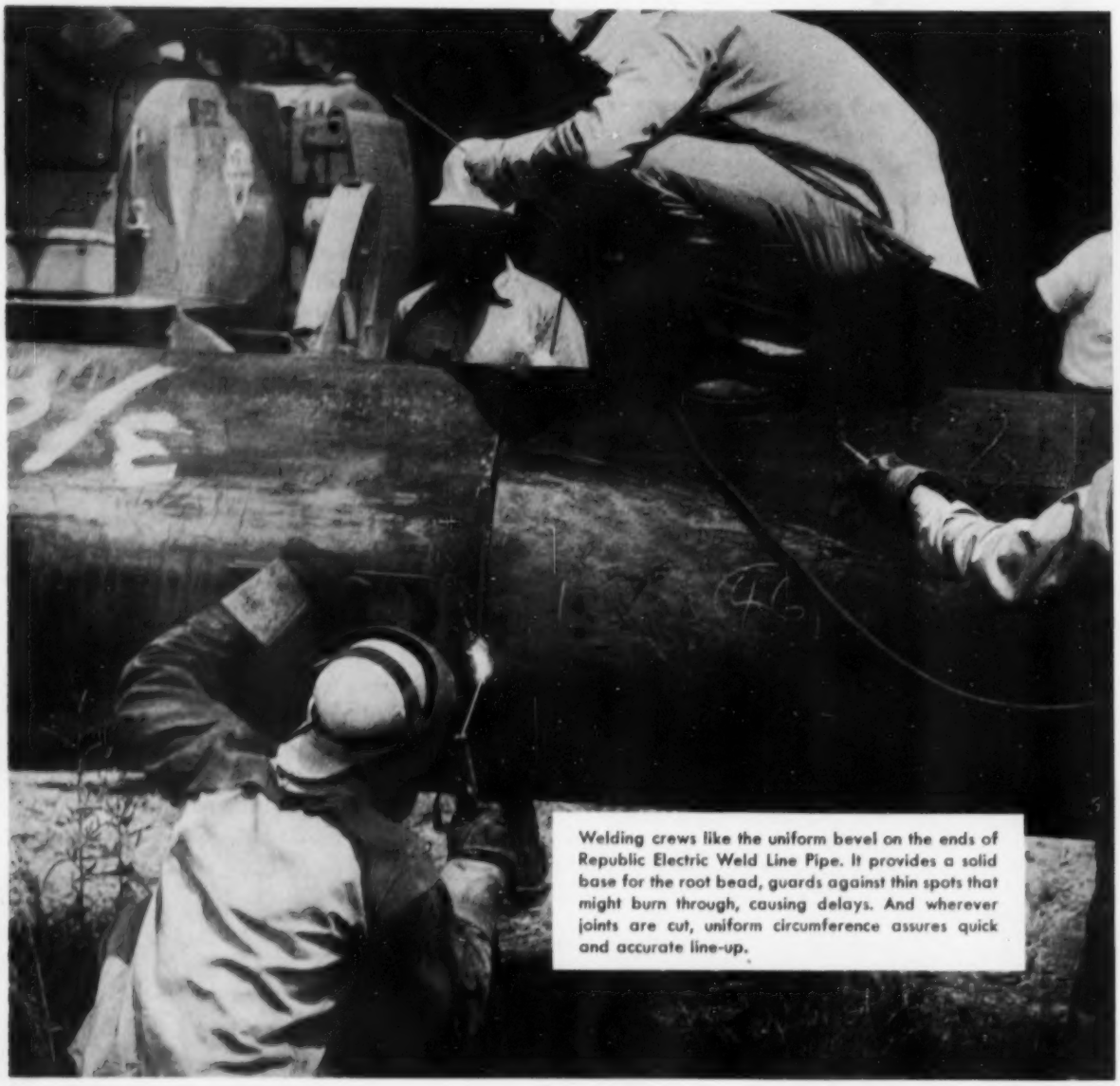
Company_____

Address_____

City_____ Zone____ State____

☐ Have RCA representative get in touch with me

You get more miles of welds per day



Welding crews like the uniform bevel on the ends of Republic Electric Weld Line Pipe. It provides a solid base for the root bead, guards against thin spots that might burn through, causing delays. And wherever joints are cut, uniform circumference assures quick and accurate line-up.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

when you're laying

REPUBLIC ELECTRIC WELD LINE PIPE

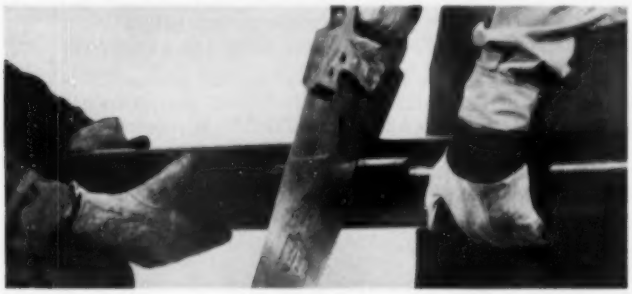
Alignment is fast with Republic Electric Weld Line Pipe because you don't waste a lot of time searching for true-fitting ends. Circumference of every length is always constant. Joints line up quickly and accurately without delay.

Pipe walls are uniform in thickness. This even distribution of metal means no thin spots to cause burn-throughs. Strong welds are easier to make. And once the line is under pressure, every inch of the wall is dependable.

Smooth field and shop bends are easy to make because Republic Electric Weld Line Pipe has high ductility. Furthermore, high yield strength makes it ideal for high-pressure lines.

Follow the experience of hundreds of successful pipeline companies all over the world. Install dependable, trouble-free Republic Line Pipe and get more miles of pipeline in the ditch every day. Electric Resistance Weld comes in sizes 2⅜" through 16" O.D.; Electric Fusion Weld from 24" through 30" O.D.; and Continuous Butt Weld from ¼" through 4" nominal.

Contact your local Republic sales office. They will be glad to work with you on any line pipe problem. *For descriptive literature—mail coupon.*



TRUSCON STEEL BUILDINGS ARE ECONOMICAL AND EASY TO ERECT. Fabricated at Republic's Truscon Division, they're designed specially for you, to suit your particular requirements. You'll get a building that's fire-resistant, well-lighted, properly ventilated and easy to maintain. Truscon engineers will help you from design to erection. Send for catalog.

WHEN YOU NEED STEEL PIPE IN A HURRY, call your Republic Pipe Distibutor for immediate delivery. He's ready to deliver one length or a whole carload. Republic Steel Pipe, made by the improved Continuous Butt Weld Process gives extra years of service—yet costs no more than ordinary pipe. It has uniform strength and ductility, is easily threaded, readily bent. Mail coupon for literature.

REPUBLIC SRK PLASTIC PIPE IS HIGHLY RESISTANT TO CORROSION. Rugged and extremely light in weight, it can be cut with an ordinary handsaw, joined quickly with solvent-welded, sleeve-type fittings. It's unaffected by sour crudes, soil acids, alkalies, and electrolysis. A big money-saver. Send coupon for literature.

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☐ Resistance Weld Line Pipe ☐ SRK Plastic Pipe
☐ Steel Pipe

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Company_____

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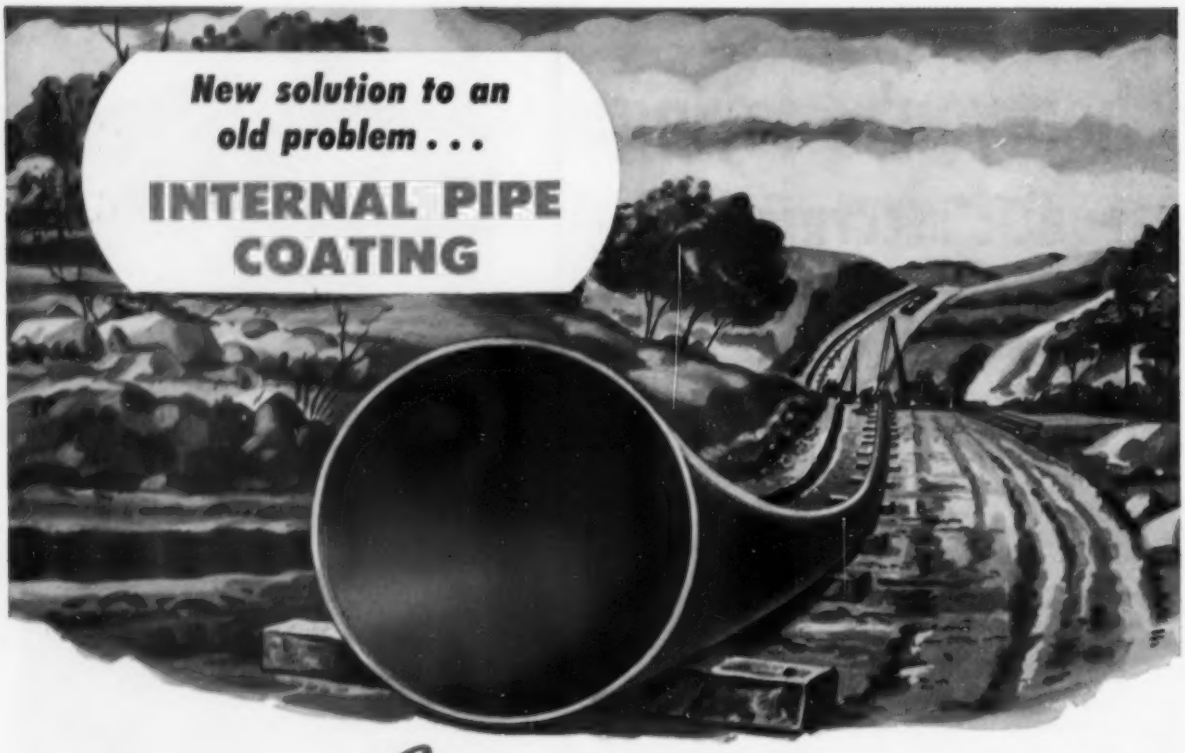
City_____ Zone_____ State_____



Copon coatings provide cleaner delivery, increased thru-put, corrosion control

Scientifically developed systems for coating . . .

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Now . . . revolutionary new internal pipe coatings that turn corrosion control *costs* into *profits*. Made from remarkable Epon® resins, COPON coatings are smooth and durable. They have increased thru-put capacities from 3% to 18%, made possible delivery of clean rust-free petroleum products, greatly reduced hydrostatic test costs and maintenance expenses. And COPON provides permanent protection . . . because COPON coatings are thicker, cling tenaciously to pipe line walls.

Efficient systems for coating new pipe, used pipe or pipe-in-ground have been developed by COPON engineers and used by leading transmission companies. For complete details —including results of tests of these applications—write your nearest COPON manufacturer today.

Get the facts about COPON. Mail coupon to manufacturer located nearest to your city.

MAIL COUPON TODAY

Please send me information about COPON Internal Pipe Coatings.

Name_____

Company_____

Position_____

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P. O. Box 1068, Tulsa, Okla.

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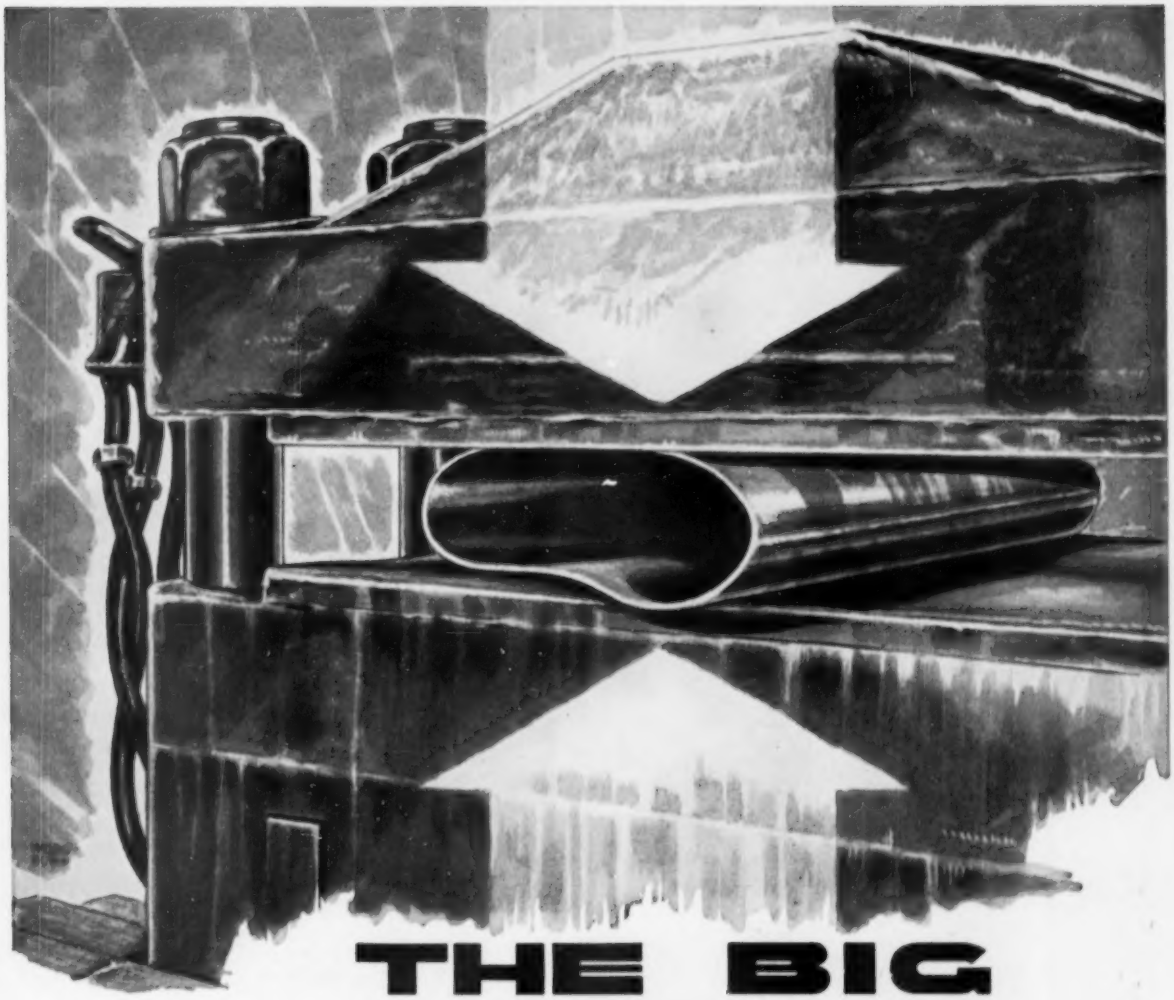


THE BIG SQUEEZE

The "big squeeze" is one of many tests to which Youngstown Electric Weld Line Pipe is subjected, to assure you a top quality product. In our process both ends of each length are cutoff and crush-tested in a massive press.

Each end section of the pipe is positioned in the press so that the weld receives the maximum effect of a steady crushing action of thousands of pounds pressure. In the "big squeeze" the weld holds fast—stronger even than its parent metal. Then the pipe continues through subsequent operations and further tests — — PROVEN and READY for efficient service in the field.

* * *

Five reasons why Youngstown Electric Weld Line Pipe is your best buy: (1) It bends readily; (2) Wall thickness is uniform; (3) Line up characteristics are excellent; (4) Weldability is outstanding; (5) Long lengths save you time and trouble. The Youngstown Sheet and Tube Company, Youngstown 1, Ohio. Sales and service offices throughout the oil and gas producing areas.

Youngstown

ELECTRIC WELD LINE PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

For effective, long-term protection against corrosion . . .

Close-up of Transhield Asbestos Pipe Line Felt, showing parallel-spaced glass yarns.

Coating and wrapping pipe line to check corrosion and assure long-term service.

. . . use Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

Johns-Manville Transhield is an economical pipe line felt assuring effective, long-term protection against corrosion under average soil conditions.

Designed for easy, high-speed application by modern machine methods, Transhield is strong and highly tear-resistant. Its light weight permits its use in 800-ft. rolls. This advantage cuts roll changes in half for field wrapping equipment.

Transhield provides a protective membrane of coal-tar saturated asbestos felt, reinforced with continuous glass yarns parallel-spaced on ¼" centers. It cannot rot or decay, thus acts as an enduring barrier to shield pipe line enamels from earth loads and soil stress.

For severe soil conditions use Johns-Manville #15 Asbestos Pipe Line felt . . . proven in service for over 30 years.

For further information about Transhield, write to Johns-Manville, Box 60, New York 16, N. Y. In Canada, 565 Lakeshore Road East, Port Credit, Ont.

Johns-Manville PRODUCTS FOR PIPE LINE PROTECTION

Announcing

TWO GREAT EVENTS FOR MAY 17TH

THE CONSOLIDATION OF THREE GREAT COMPANIES

acf Valve Division, W-K-M Manufacturing Company, Inc., and the Key Company — all members of the acf Industrial Family — have been brought together as W-K-M Manufacturing Company, a subsidiary of acf Industries, Inc.

Management, Manufacturing and Marketing facilities of all three are now centralized in this new 12-acre completely air-conditioned office and plant at Missouri City, Texas, a few miles west of Houston.

This consolidation provides important efficiencies of production of W-K-M Through-Conduit Valves, acf Lubricated Plug Valves, Key Return Bends, and Key-Kast Welding Fittings. These products, with a long established reputation for excellent service and performance, will continue to be engineered, manufactured and sold by the same experienced personnel who were instrumental in building that reputation.

OPENING OF A GREAT NEW PLANT THURSDAY, MAY 17TH TWO to SEVEN P. M.

You are cordially invited to inspect our new Plant and Office at Missouri City, Texas, just a few miles west of Houston.

Special transportation from downtown Houston to the plant will be provided for visitors. Please write immediately for your Transportation Pass. Address W-K-M Manufacturing Company, Guest Committee, P. O. Box 2117, Houston, Texas.

W-K-M MANUFACTURING COMPANY, INC.

A SUBSIDIARY OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS • MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

MANUFACTURING

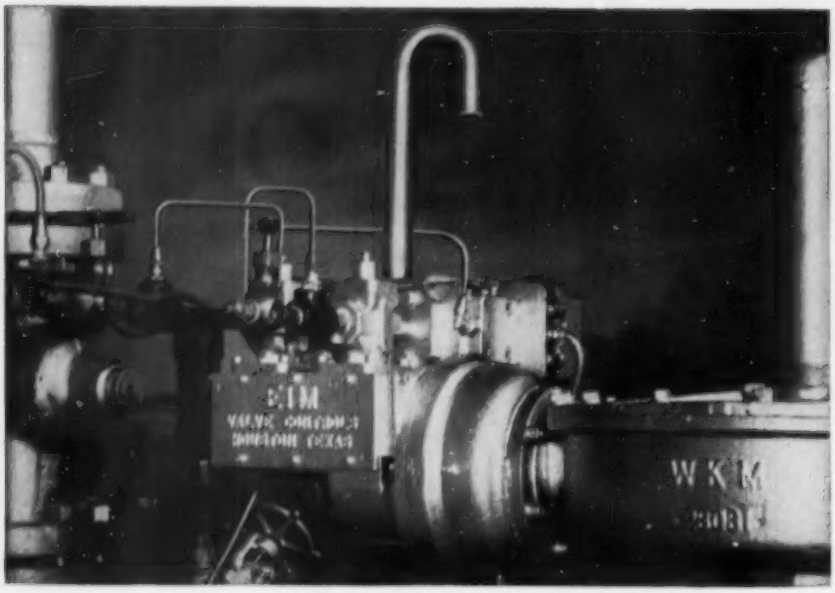
W-K-M THROUGH-CONDUIT GATE VALVES

acf LUBRICATED PLUG VALVES

KEY RETURN BENDS AND FITTINGS

PROGRESSIVE GAS PIPE LINERS SPECIFY . . .

E-I-M PIPE LINE VALVE CONTROLS



Some 300 Type G-2 valve controls are employed in Texas Eastern Transmission Company's stations and along the line.

The G2 takes its source of power from the medium in the transmission line, without any pressure reduction. There are no small parts. It's a compact unit with all piping, valving and controls integrally arranged. Field piping is kept to a minimum. Actually, only one small line from the pressure source to the valve control is required.

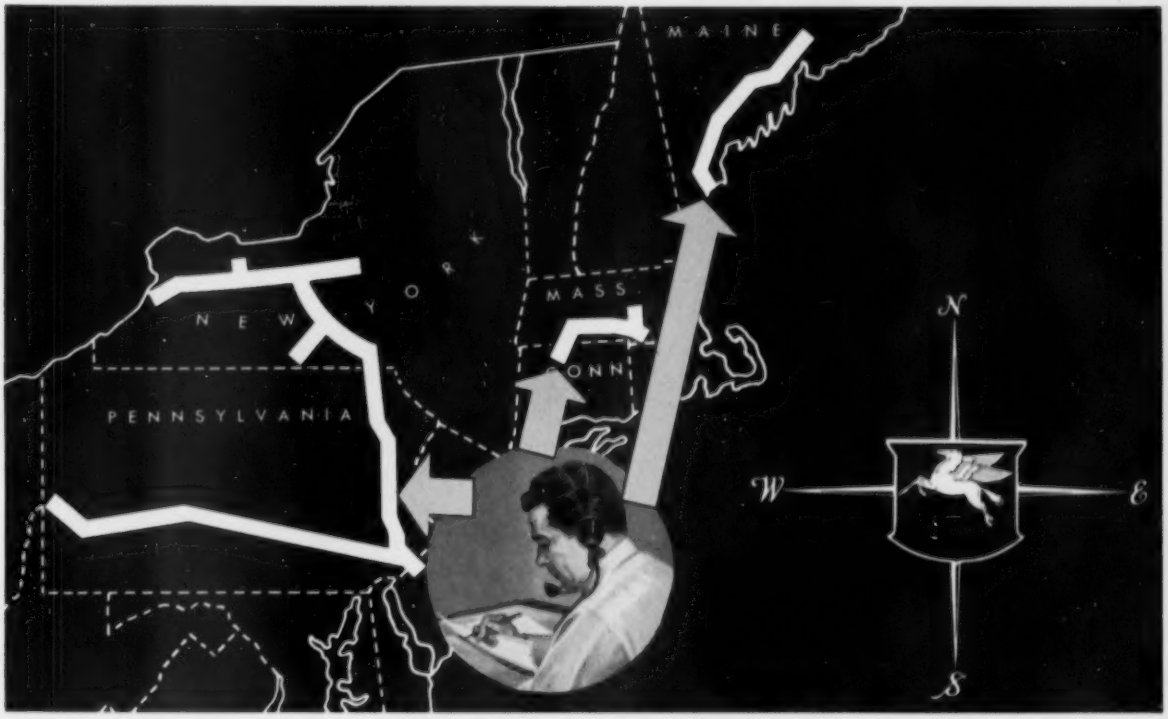
E-I-M VALVE CONTROLS ARE HELPING TO PROTECT MOST OF THE MAJOR PIPE LINES. IF YOU HAVE A PIPE LINE CONTROL PROBLEM, CHECK FIRST WITH E-I-M. THERE IS A WHOLE FAMILY OF E-I-M STANDARD CONTROL DEVICES, AROUND WHICH ENGINEERS MAY DESIGN THEIR OWN CUSTOM-BUILT VALVE CONTROL SCHEMES. E-I-M VALVE CONTROLS ARE DESIGNED TO OPERATE GATE, GLOBE, PLUG AND BUTTERFLY VALVES, AND THEY MAY BE ADAPTED FOR OTHER PURPOSES. THEY MAY BE OPERATED ELECTRICALLY, PNEUMATICALLY AND HYDRAULICALLY. INSTRUMENTATION MAY BE FULLY AUTOMATIC, UTILIZING VHF RADIO OR OTHER MEDIA.

E-I-M valve controls offer flexibility of installation and operation.
Remember: They may be installed on your present valves in the field.

Write for our descriptive folders.

E-I-M Company INCORPORATED

1340 OLD SPANISH TRAIL • HOUSTON 25, TEXAS • MOhawk 4-4587
Valve Controls • Speed Reducers • Cooling Tower Drives • Control Valves



The dispatcher receives hourly reports on pressure, temperature, gravity, and rate-of-flow from each station on three pipe lines.

SOCONY MOBIL OIL COMPANY, INC., REPORTS:

One dispatcher controls three eastern pipe lines with Bell System private line telephone service

24 YEARS OF SATISFACTORY SERVICE

One dispatcher—in Plainfield, N. J. —controls 1077 miles of Socony Mobil pipe line in seven states, as shown on the map above.

He uses Bell System private line telephone service to get hourly reports on pressure, temperature, gravity, rate-of-flow and other operating information from as many as 60 points along the system.

Over the same facilities, he issues orders to cut in additional pumps or cut them off, run gasoline and distillates into tanks, or put products into the line from refineries.

Socony Mobil started using Bell System private line communications 24 years ago, and the company's growth has been accompanied by a corresponding growth in its communication system.

The Bell System can supply services to fit *your* exact communication needs, too. Just call your Bell Telephone representative for further information.

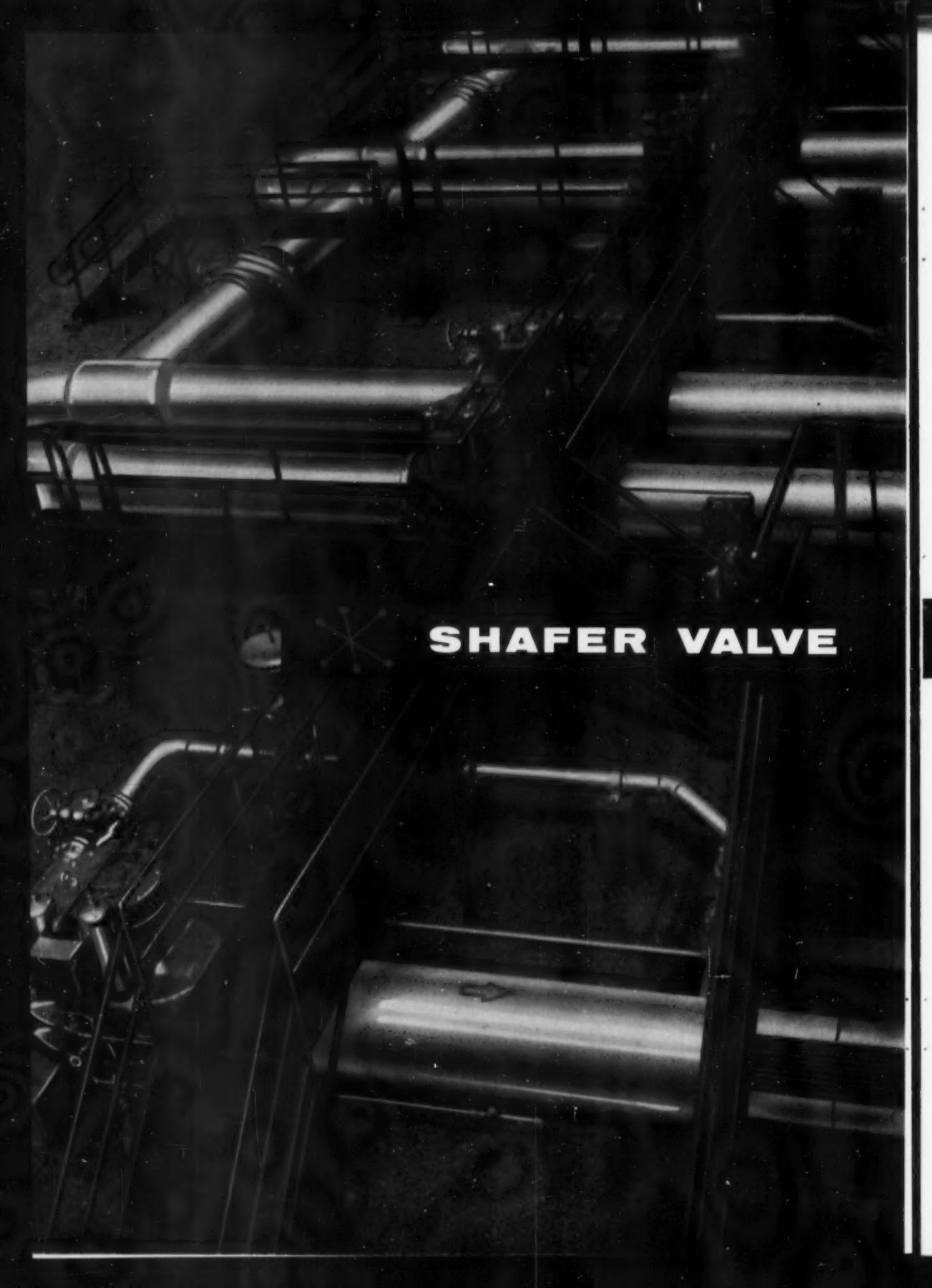
Socony Mobil uses these Bell System private line services:

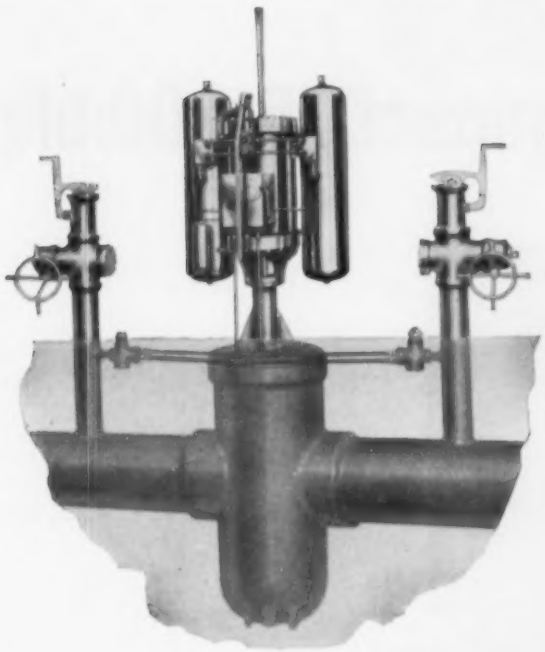
Private line telephone service for pipe line dispatching and general administration.

Private line teletypewriter service for fast written communication between New York headquarters and the Paulsboro, N. J., refinery.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER TELEMETERING AND REMOTE CONTROL CHANNELS

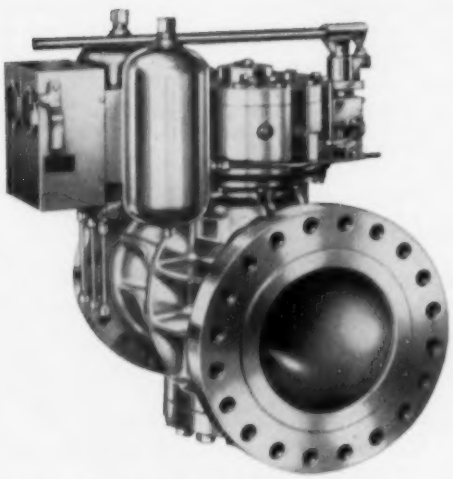

SHAFER VALVE



Shafer Valve Operator with automatic and manual control mounted on a 30-inch gate valve.

for speed
of operation . . .
balanced power,
with only one
moving part . . .
proven reliability

OPERATORS AND CONTROLS



Shafer Valve Operator with automatic and manual control mounted on a 16-inch lubricated plug valve.

SHAFER
VALVE COMPANY, INC.

MANSFIELD, OHIO

NOW... a compact 75-200 bhp

FEATURES

BALANCED/OPPOSED COMPRESSOR DESIGN
Virtually vibrationless . . . a couple of yards of concrete will easily level it. Perfect for barge or truck mounting.

DIRECT CONNECTED
Eliminates belts or gear drives. Reduces skid size, housing costs. Simple rubber block couplings.

ONE PIECE SKID
Simple to install, move or shelter . . . only 7' 3" x 15', rigid heavy "I" beam construction.

TWO STAGE
For maximum efficiency and thru-put.

CONSERVATIVE PISTON SPEED
Lower than on most Clark stationary compressors, assures long cylinder life.

HEAVY DUTY RADIATOR
Straight finned tubes. Easy to inspect or clean, inside or out. Provides intercooling and cylinder jacket cooling.

FACTORY ASSEMBLED AND TESTED
No field assembly. Shipped as a complete unit.

STANDARD ENGINE DESIGN
Five makes of proved engine designs available.

APPLICATIONS
Use it for gas lifting, gas gathering, gas boosting, pipeline testing, recycle plant feeders, other field services.

Packaged Compressor

Designed by Clark for gas lifting or gathering

CFA now on tour
—in Oklahoma, Kansas, Colorado, Texas and Louisiana.
Watch your newspaper for date and location of demonstration.

You asked for this field compressor—as rugged, compact and perfectly balanced as the famed "Midget Angle" but of half the horsepower.

Now you have it, in the new Clark Model CFA. Rated at 75-200 bhp, this packaged compressor station is ideal for gas lifting or gas gathering of from one to a dozen wells. This is particularly true when well spacing is wide and multiple sands are being worked.

The CFA uses a new specially designed 5" stroke balanced/opposed compressor directly connected to a standard design gas engine. The compressor and engine, together with a heavy duty radiator, scrubber, etc., are mounted on a rugged steel skid.

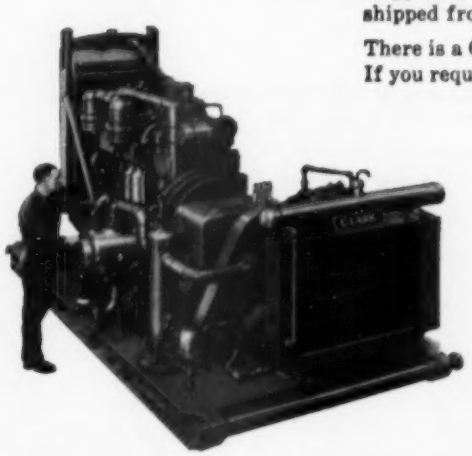
The CFA is virtually vibrationless in operation because of its balanced/opposed action. In most cases the small amount of concrete used to level the unit will provide ample support.

Operating at engine speed eliminates the need for cumbersome belt and gear drives. The resulting compactness permits mounting the complete unit on a skid measuring only 7' 3" x 15'.

Easily and speedily transported on an average size truck, this new field compressor can also be operated on truck or floating barge. The compact design minimizes costs if a shelter is required.

You have no field assembly problems. The CFA is factory assembled, tested and shipped as a complete unit. Because of standardization the CFA can be shipped from stock in most instances.

There is a Clark CFA specialist in your area to give you all the facts.
If you require greater horsepower, ask him about the Clark HMA and HMAB.



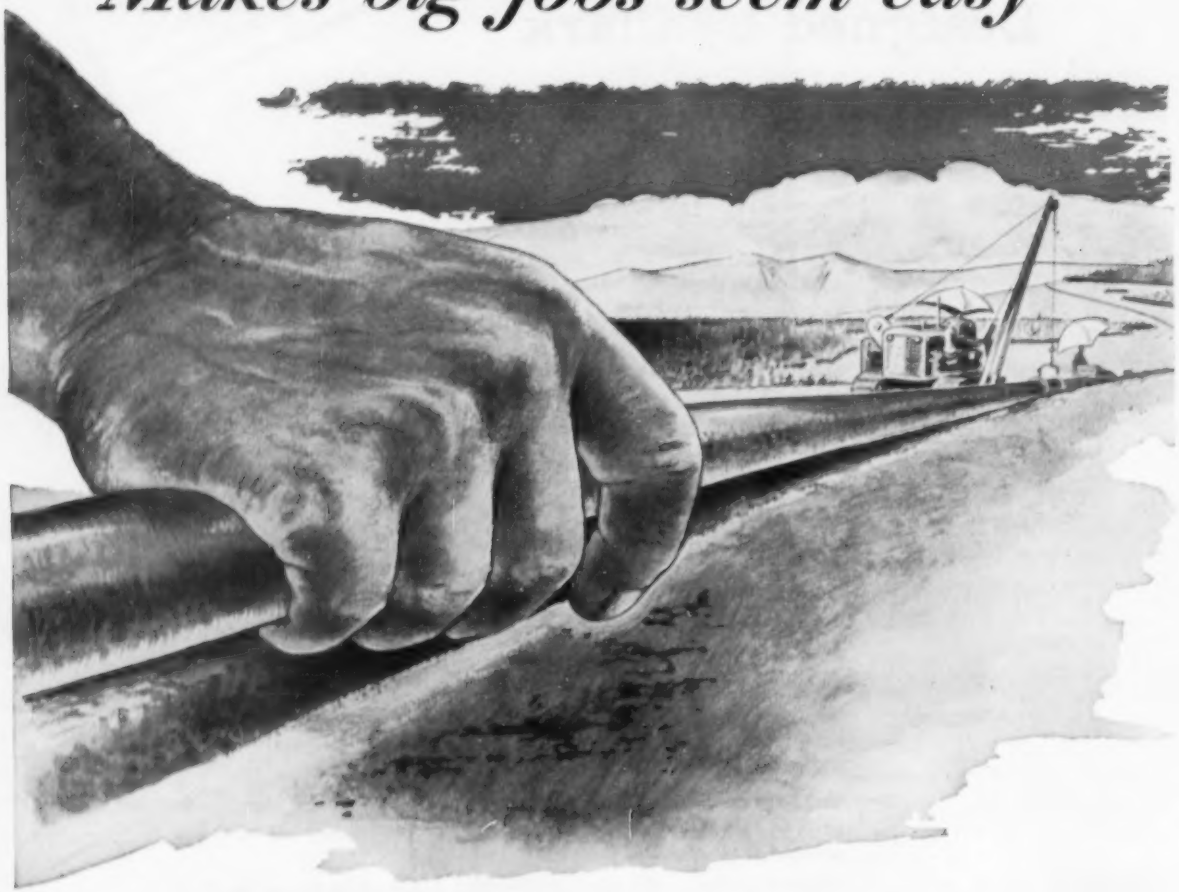
CLARK BROS. CO., OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Offices in Principal Cities Throughout the World

CLARK®

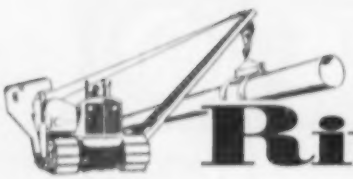
Packaged Compressors

River

Makes big jobs seem easy



It takes planning, equipment and trained crews to complete pipeline contracts ahead of schedule. It takes the experience gained in the thousands of miles of pipeline that River has finished to overcome the obstacles of terrain and weather and come out ahead. Put River Construction to work on your next contract and watch the job completed... to your satisfaction — *on time!* River is just the right size... big enough to handle any job... small enough to give your contract the personal attention it deserves.



River CONSTRUCTION CORPORATION

ROBERT THOMAS
J. C. BRISCOE
J. C. MINYARD

GENERAL OFFICES: 4837 WEST FREEWAY. P. O. BOX 9127, FORT WORTH, TEXAS

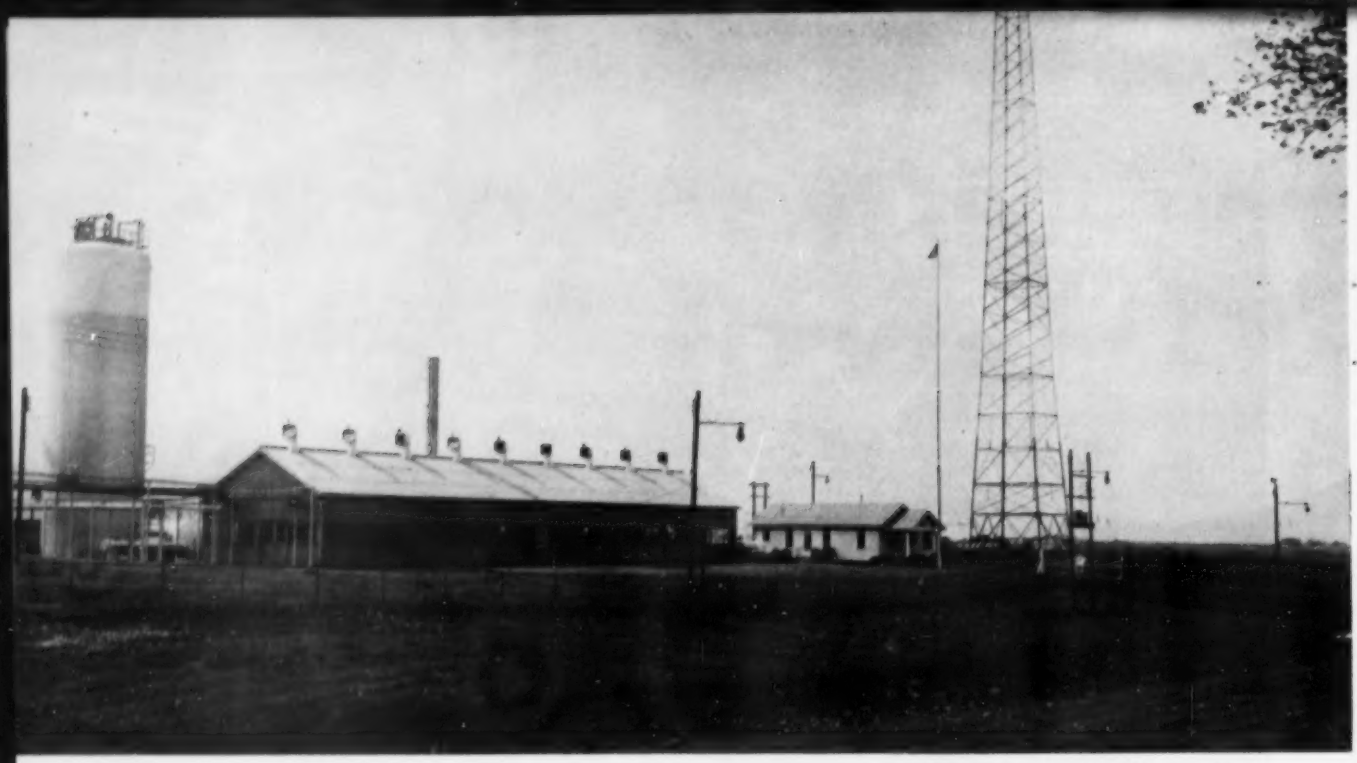
Twin pipelines feed Peoples Gas system from Texas Panhandle

By J. FRED EBDON • Editor

FROM the Texas Panhandle and from the Texas Gulf Coast—two separate and distinct natural gas supply areas, hundreds of miles apart—two long-distance, large-diameter pipeline systems thread their way to the Chicago area to bring natural gas to the burnertips of appliances operated in the service area of Peoples Gas' distribution system and those of utility customers. These dual transmission properties are subsidiaries of Peoples Gas. The system from the Panhandle to Joliet, Ill. is owned and operated by Natural Gas Pipeline Co. of America. The Gulf Coast-to-Joliet system is owned and operated by Texas Illinois Natural Gas Pipeline Co. Consumers in the Chicago area have the surity of service resulting from constant operation of two pipeline systems, each with its own gas supply.

Two parallel, large diameter pipelines—one 24-in. OD and the other 26-in. OD—start near Fritch and Stinnett, in the Texas Panhandle, cross the Oklahoma Panhandle, diagonally bisect Kansas, slip through the southeastern corner of Nebraska, and square away for a run across Iowa and Illinois to Joliet. These parallel pipelines cover 900 miles, bringing natural gas from the Panhandle field in Texas and the Guymon-Hugoton fields in Oklahoma to Peoples Gas, three other utilities in the Chicago area, and to 14 utilities at various points along the route.

Natural Gas Pipeline Co. is a true pioneer in the long distance transmission segment of the gas industry. In 1930 a rugged group of men started construction on the first big-inch, long distance high-pressure pipeline—a job many engineers of the day said could not be done. However, the job was done in good or bad weather and with equipment that would be considered inadequate for 24-in. OD pipe on a pipeline construction spread today. Many of these men are said to have walked from Texas to Chicago during the construction phase. They worked all the



Compressor station 110 at Geneseo, Ill., is typical of the 10 mainline stations that furnish energy to move the gas through Natural Gas Pipeline Co. of America's 900 miles of parallel lines.

way, too, through mud and rain, wind and snow, but the line was completed and natural gas started to flow into the Chicago distribution mains on the afternoon of Oct. 16, 1931. Mighty rivers like the Mississippi and Missouri, plus 100 lesser streams had not thwarted the ambitions of these gas industry pioneers.

Many longer and larger diameter pipelines have been installed since that time, but few represent the true spirit of industrial adventure as characterized by the construction of the Natural Gas Pipeline Co.'s initial 24-incher.

Completed in 1948

The parallel 26-in. OD line was completed in 1948 as the demand for more gas became acute in the Chicago area. The daily capacity of the dual pipeline system was 500 MMcf at that point in its development. Just prior to the completion of the second line, Natural Gas Pipeline Co. of America became part of the Peoples Gas integrated family of companies.

Natural Gas Pipeline owns natural gas reserves in the Panhandle field from which it produces about one third of its present natural gas requirements. The remainder of its gas requirements comes from major and/or independent producers.

An extensive gathering system is owned and operated by Natural Gas Pipeline Co. in the Texas Panhandle field. This system is composed of many smaller diameter lines that bring the natural gas from the wellheads to the processing plants.

Two gasoline extraction, dehydration, and compressor plants are the focal points of the gathering system. The extraction plant at Station 112 near Stinnett, Texas, is typical of this operation. This plant has capacity for stripping approximately 85,000 gal. of natural gasoline and L. P. gas products per day from the 178 MMcf/day of natural gas processed.

From the gathering and processing equipment, the gas enters the mainline and begins the long trek toward the market area. To maintain an economical volume rate of flow, 10 mainline compressor stations and two field stations — aggregating 156,500 hp — are spaced at approximately 90-mile intervals. These stations are some of the oldest, but best maintained, units in continuous operation on transmission facilities today. The terminal point of the transmission system is the Joliet metering and pressure regulating stations.

The original 24-in. pipeline was constructed as a partially welded line. Every other joint was made with a mechanical coupling as was the technique of its construction period. The 26-in. parallel line was solid welded. The current capacity of the lines is 522 MMcf/day. About 75% of this gas is delivered

Mechanics at NGPL compressor station remove a piston rod from a horizontal compressor engine. The piston was removed as part of the maintenance program carried on at all stations.

to the Chicago District Pipeline Co. for distribution in the Greater Chicago area; the remainder is served to utility customers along the line and to heavy industrial consumers.

Typical station

Compressor station 110, located at Geneseo, Ill., is typical of the 9 other mainline and two field stations that furnish the energy to move the gas through these parallel pipeline facilities. It is a complete compressor facility, having its own electric generating plant, warehouse, machine shop water supply and treatment facilities, sewage disposal plant, and modern cottages to house key operating personnel necessary to maintain 24-hr daily operations. The superintendent at Station 110 is affable Arch Yingling, veteran pipeliner and engine man. Ed McCann is the pipeline superintendent for the district in which Station 110 is located —from Joliet, Ill. to Muscatine, Iowa, including the 20-in. lateral to the Wisconsin line through the Rock River valley.

The dual pipeline system crosses the Mississippi river a few miles east of Station 110. The 24-in. line ties into a 24-in. header and two 18-in. lines tie into the same header and traverse the river's flood plains. The two 18-in. lines tie into a header from which emanate six 12-in. lines in two batteries, i.e., three 12-in. lines form the battery for the actual underwater crossing. The mainline 26-incher makes the Mississippi underwater crossing after tying into two 22-in. lines. The approaches and crossings have been hard to keep in their trenches as the Mississippi is a river of whims and chance. Natural Gas Pipeline Co. has built protective dikes, riprap, and embankment protection to control the forces unleashed by the capricious river's flow. Erosion control and bank maintenance efforts at this crossing, as well as at other crossings along the route of the lines, is very outstanding. Operations such as these illustrate the many and varied tasks of a pipeline company other than the better known, routine operations.

Station 110 first powered the line with five engines that were installed in 1931. In 1940, three additional engines had to be added as the demand on the lines necessitated bringing the installed horsepower to its present level of 10,000. Worthington twin-tandem, double-acting, 24-in. by 36-in. horizontal units—rated at 1250 hp each—do the job at the Geneseo station. Other mainline stations utilize 10 or 11 of the same type engines.

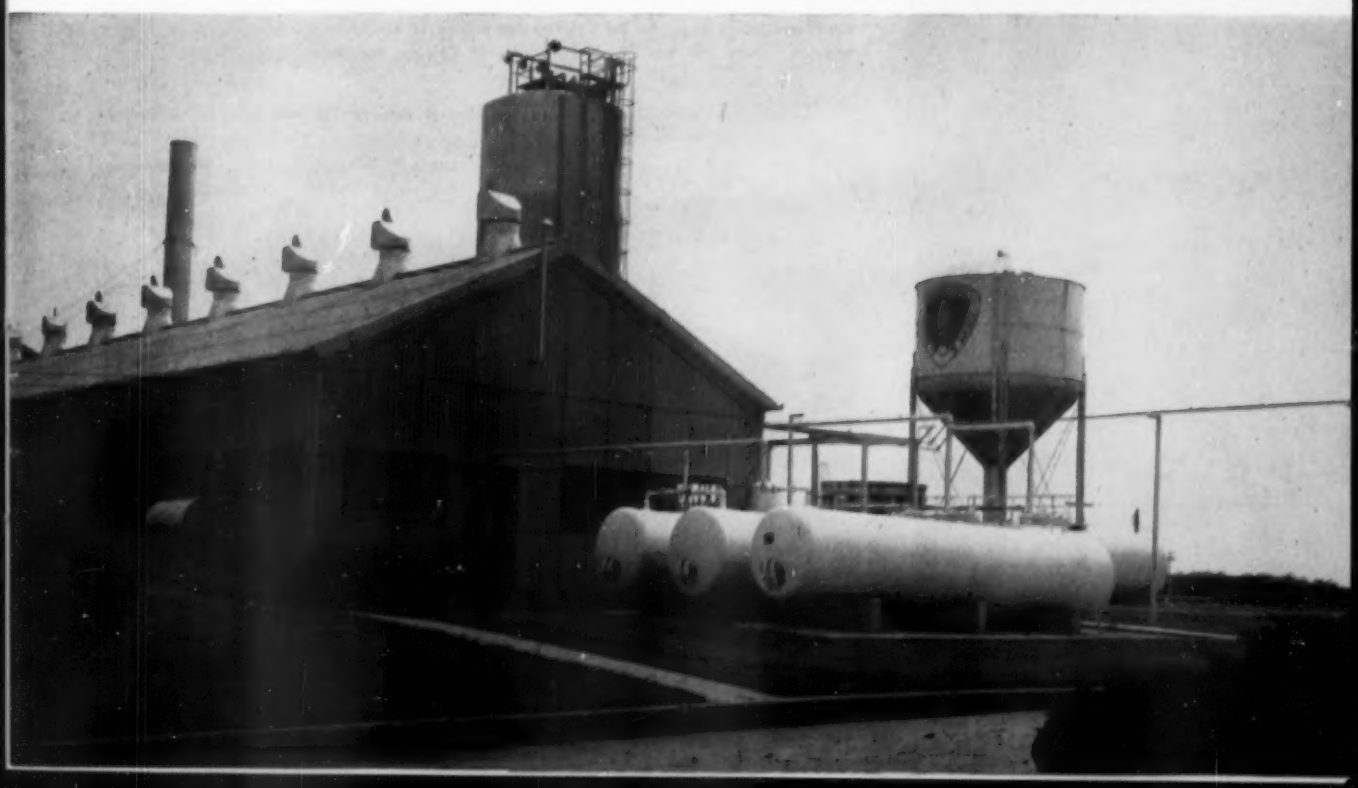
The five engines installed in 1931 have a lot of operating hours on them, but they are still in excellent shape and going strong. Some of these engines have as high as 134,000 hours logged. Preventive maintenance is the answer to retaining the designed efficiency in these well used prime power units. Each unit is overhauled once a year by the experienced compressor station complement. This program, plus the inherent ruggedness of the engines as built, has obviously paid off.

Station operating water is circulated in an open system. There are three Zeolite water treatment units (Permutit tanks with Elgin heads) and a deoxidizing tower in the system. Water is circulated by seven Dayton Dowd pumps—five are 2000 gpm and two handle 3000 gpm. An atmospheric cooling tower furnishes cooling water for engine jackets and the lube oil cooler.

Gas-fired engines

The electric generating plant has two Cooper-Bessemer HCA 120 engines, rated at 260 hp each, driving the generators. These units are gas fired and operate at 277 rpm. They were installed in 1930. Another generator is powered by an Ingersoll-Rand PVG, 275-hp natural gas engine operated at 400 rpm. Complete switch gear and electricity distribution equipment is installed.

The programs covering maintenance, safety and housekeeping at Natural Gas Pipeline's compressor station are outstanding. This is true for all the stations along their system. The engines are all



Another view of station 110, showing the main compressor house, the lubricating oil tanks (foreground), the deoxidization tower and the water tower.

Natural Gas Pipeline Co. of America welders are girth-welding a sleeve at a joint during maintenance work on the line's large diameter pipe.

being repainted and it was a revelation to us to see the job that was being done as the big rough-cast steel engines were cleaned, sanded, filled, and painted until they looked like just installed new engines. This policy carries over into all the station equipment and buildings. Natural Gas Pipeline's stations not only are efficient, they look efficient. The men that operate them are justly proud of the facilities.

The nine original NGPL stations are some 25 years old. All the piping in the station manifold areas was originally installed underground and has remained there to be subjected to electrolysis and soil stress, in addition to the mechanical stresses usually experienced around a reciprocating station. The underground installation prevented easy inspection and maintenance of the manifold areas, so in 1952 a program was started to expose piping in these areas at Stations 107 (Emerson, Iowa) and 108 (Truro, Iowa). These activities have resulted in the "Sunken Gardens" that have achieved some fame in the gas industry.

To make a "sunken garden," the earth fill over the manifold areas is excavated to expose the piping where the compressor station suction and discharge lines are manifolded into the main suction and discharge headers. The design of the piping had to be changed to reduce vibration, and to reduce stresses caused by expansion and contraction of the exposed runs.

$150,000 per station

After this work is done, the pipe is reconditioned, a crushed rock over-burden is added to the floor of the "garden," and the piping is left exposed for ease of observation and repair. These jobs cost about $150,000 per station and have been completed at the nine original stations except Stations 103 (Minneola, Kan.) and 106 (Beatrice, Neb.) — these will be completed this year.

Another project underway is the deepening of the basements of the older main compressor buildings. These basements become almost unbearably warm during the summer, so experimental work on Station 104 has shown that if the basements are lowered 36 in. along one side, the air circulation is improved to offer better cooling and the basement piping is more readily accessible. Work will continue on this program

Crew uses power auger to dig hole for installation of anode on pipelines bringing natural gas from Texas Panhandle to Chicago distribution area.

Small tractor-mounted backhoe is used to dig bell hole during leakage location and repair work.

all along the line in 1956. Between $30,000 and $90,000 is required to make this modification, depending on the size of the station.

Another item of major importance in NGPL's compressor department is the installation of remotely controlled blowdowns at each of the stations. Work on this program is due to get underway on Stations 111, 112, and 101—in the gathering system area—during 1956 at a probable cost of approximately $63,000. This is strictly a safety feature and is in line with Natural Gas Pipeline's policy of emphasizing safety in all of its operations. A blowdown system that will free a station and yard piping of gas under pressure in about 30 seconds after an emergency is important to persons and property. Such blowdown systems have been proven on the Texas-Illinois system and at booster stations owned by NGPL in the Panhandle production area.

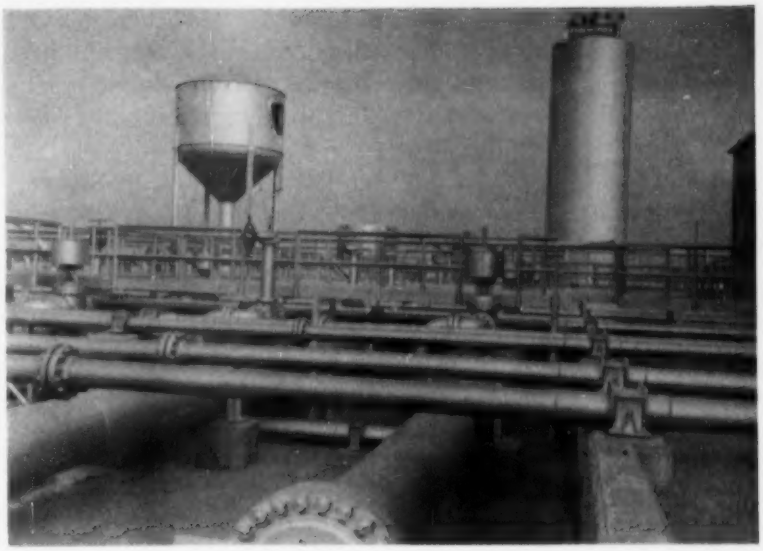
Maintenance

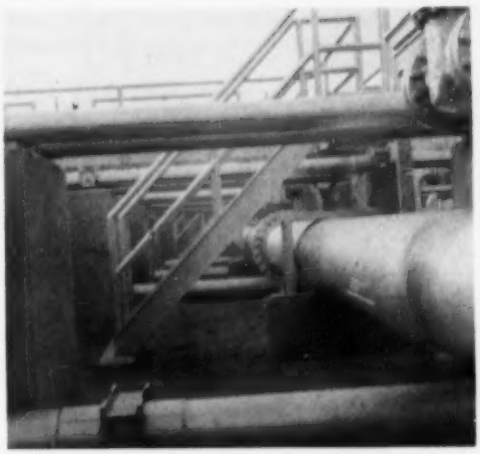
A lot of time and money is being directed toward maintenance and preventive maintenance of the pipelines. On the 24-in., the pipeline department is doing a lot of bonding on the mechanical couplings so that the cathodic protection system is assured of being electrically continuous. Also, sleeving work over the original compression type couplings is going on at this time.

Preventing soil erosion along the pipelines has been a big part of the pipeline department in recent years. This program is another subject for a story within itself.

Natural Gas Pipeline Co. has its own four-wire telephone system linking Chicago with Texas. Field offices, compressor stations, and other operating points are tied in on this net. In addition, FM radio equipment is installed at all stations and in the maintenance trucks and cars. These media are invaluable in field work.

The work of keeping the pipelines and their necessary equipment in tip-top shape is a never-ending job with NGPL. Their housekeeping within the stations along the line and the outer appearance of the facilities are creditable evidence of the pride personnel takes in being a part of a pioneer pipeline company that is doing a gas supply and transmission job for the betterment of gas service to customers of the integrated system.





Program to expose station piping originally buried at older stations produces "sunken gardens," and greatly facilitates maintenance work. Sunken gardens such as shown here have been installed in several of NGPL's stations. This construction costs the company approximately $150,000 per station.

Soil conservation measures carried out by Natural Gas Pipeline Co. of America along its 900-mile pipeline route are oustanding. When the pipeline first invaded farmlands, farmers were apprehensive. Now they have discovered that NGPL's continuous soil conservation program has helped them immensely. All control measures are worked out to be mutually beneficial.

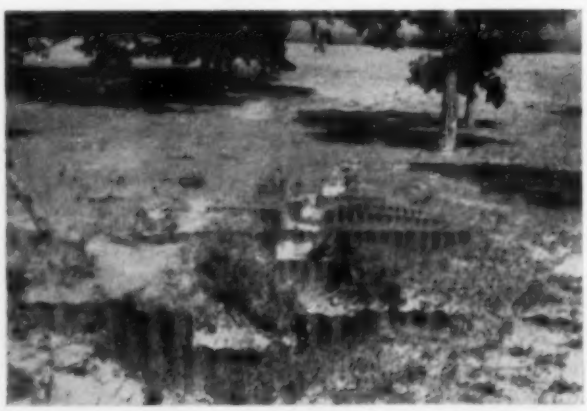
This dam was built to protect the pipeline from erosion caused by a stream running through farm. Farmer now has watering tank for stock.

Levees such as this have been built all along the system, providing the company with erosion control and the farmer with more usable water.

Drainage projects, as shown here, have been built to help control flow of water that could damage pipeline in farmland areas.

Rain water runoff is controlled by facilities of this type on route of the pipelines. In background sign marks route of parallel pipelines.

Pipeline crews constructed this retaining wall along a fast moving stream in northwestern Illinois farming areas. Bank is shored up to protect pipeline and farmland as well.



Corrugated sheet steel has been driven into ground during pipeline maintenance operations to direct course of stream that could cause erosion of pipeline cover.

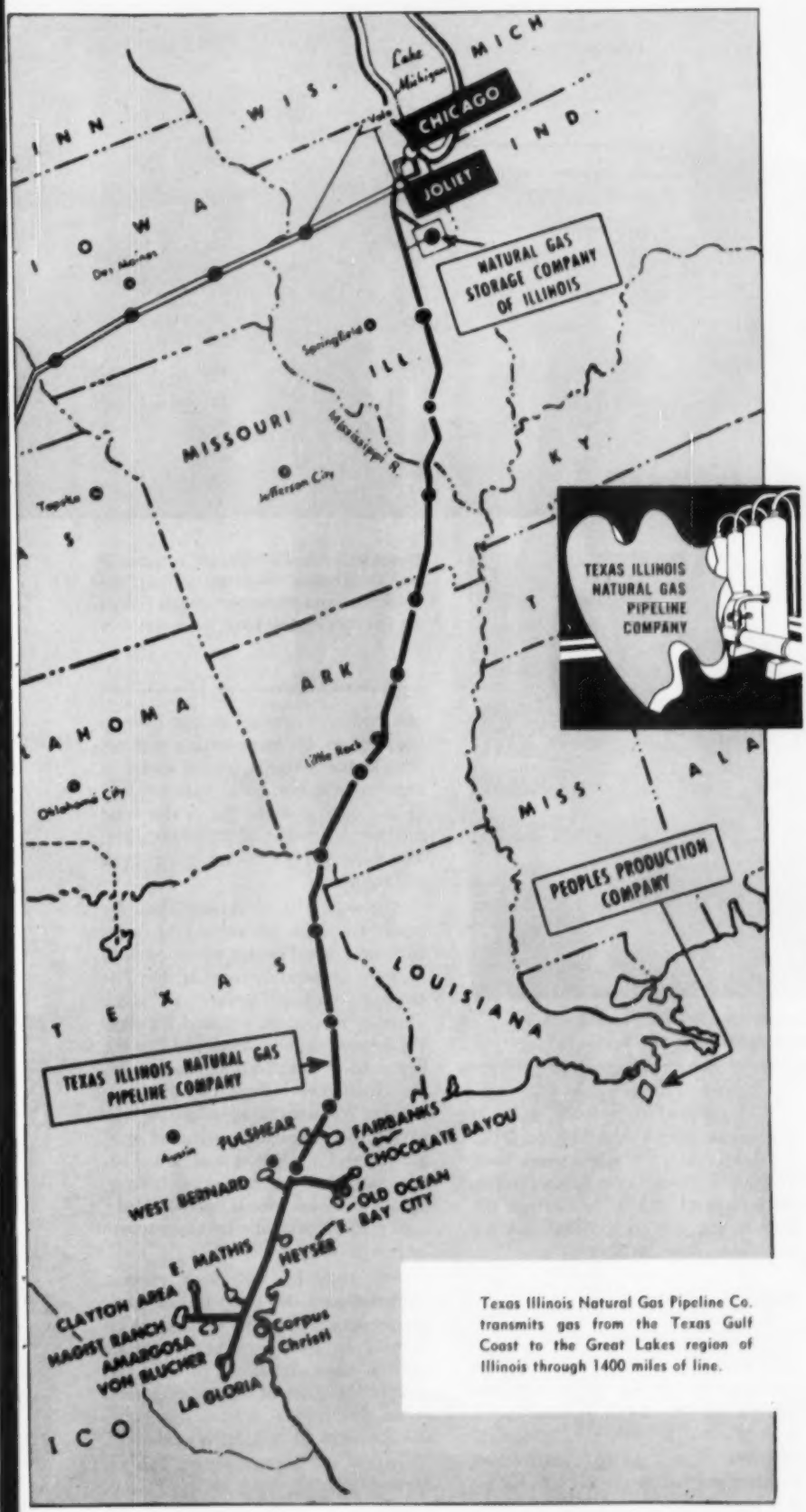
Big-inch line brings gas to Chicago from Gulf Coast

DUE to the pioneering status of the NGPL's facilities, the 30-in. OD line owned and operated by Texas Illinois is blessed or cursed—depending on your point of view—with the homespun title of the "new line" or the "third line." In any case, it is a 1400-mile, solid welded, mostly 30-in. line designed to bring natural gas from the prolific Gulf Coast gas fields of Texas to the Metropolitan Chicago area.

The Texas Illinois line was born out of the necessity to bring still more gas to the Peoples Gas service area. Natural Gas Pipeline had reached its capacity by that time and it was thought advantageous to connect with a separate and distinct gas supply area for the additional gas.

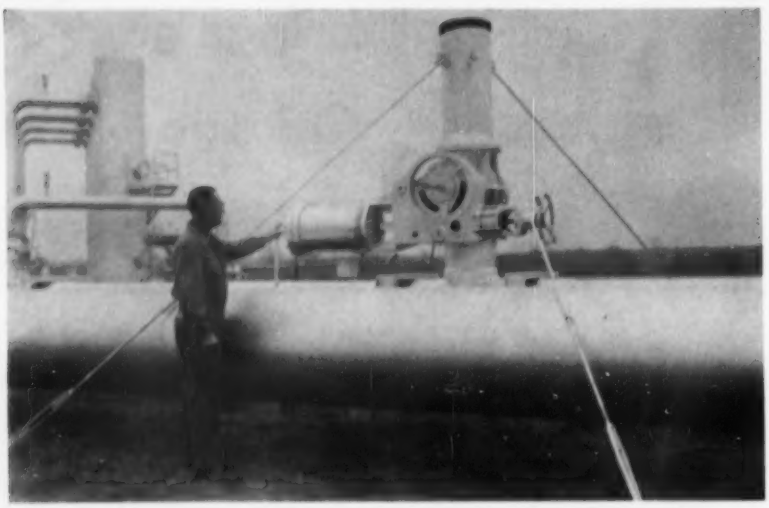
The Texas Illinois system starts deep in the lower Texas Gulf Coast with a gathering system that brings gas from hundreds of independent producers into the mainline under 35 individual gas purchase contracts. Only dry, processed natural gas is purchased and metered by Texas Illinois (TI).

Gathering lines extend as far south as Jim Wells county in the Rio Grande valley of Texas. The main gathering line that parallels the Gulf Coast is a 26-in. OD job from LaGloria to Station 301 on the 30-in. mainline near Wharton, Texas. From there, the transmission line traverses Texas in a northeasterly direction, across Arkansas, brushes through the southeastern tip of Missouri, and into Illinois. It passes close to the Herscher storage field and terminates at Joliet where it delivers its impressive volumes to Chicago District Pipeline Co.



Texas Illinois Natural Gas Pipeline Co. transmits gas from the Texas Gulf Coast to the Great Lakes region of Illinois through 1400 miles of line.

Station 310, near Centralia, Ill., is typical of the 11 mainline compressor stations that power the Texas Illinois Natural Gas Pipeline Co. line from the Gulf Coast to Chicago area.



Superintendent Jack Clifton inspects blowdown exhaust stack equipped with automatic valve operator at Texas Illinois compressor station 310.

Texas Illinois' system was completed in December 1951 and delivered a peak capacity of 384 MMcf/day, as powered by the five initial compressor stations. Since then, six additional compressor stations have been added to the mainline to bring it to its present capacity of 519 MMcf/day. About $174 million has been invested in this property as it stands today.

Station 310, located near Centralia, Ill., is typical of the 11 mainline compressor facilities that power the Gulf Coast-Chicago line. In outer appearance it reflects the pleasing landscaping and housekeeping that characterize installations within the Peoples Gas family of integrated companies.

The gas-fired compressor units in this station are six Worthington UTC-1610, vertical, two-cycle engines rated at 2000 hp each. Five of these units were installed in 1952 at the time the station was put on the line and the sixth was added in 1953.

Stations standardized

Stations 307, 309, and 311 are powered with Cooper-Bessemer GMW-8's also rated at 2000 hp. All of the Texas Illinois stations are maintained at a high state of neatness and efficiency. The wear records, parts rooms, etc., are standardized in the several stations, so that personnel who are transferred from one station to another do not have to learn the set-up. An operating engineer who knows where a certain gasket is kept in his station could walk into any of the other stations, go to the same relative place, and find the gasket there. The same applies to any other parts and equipment.

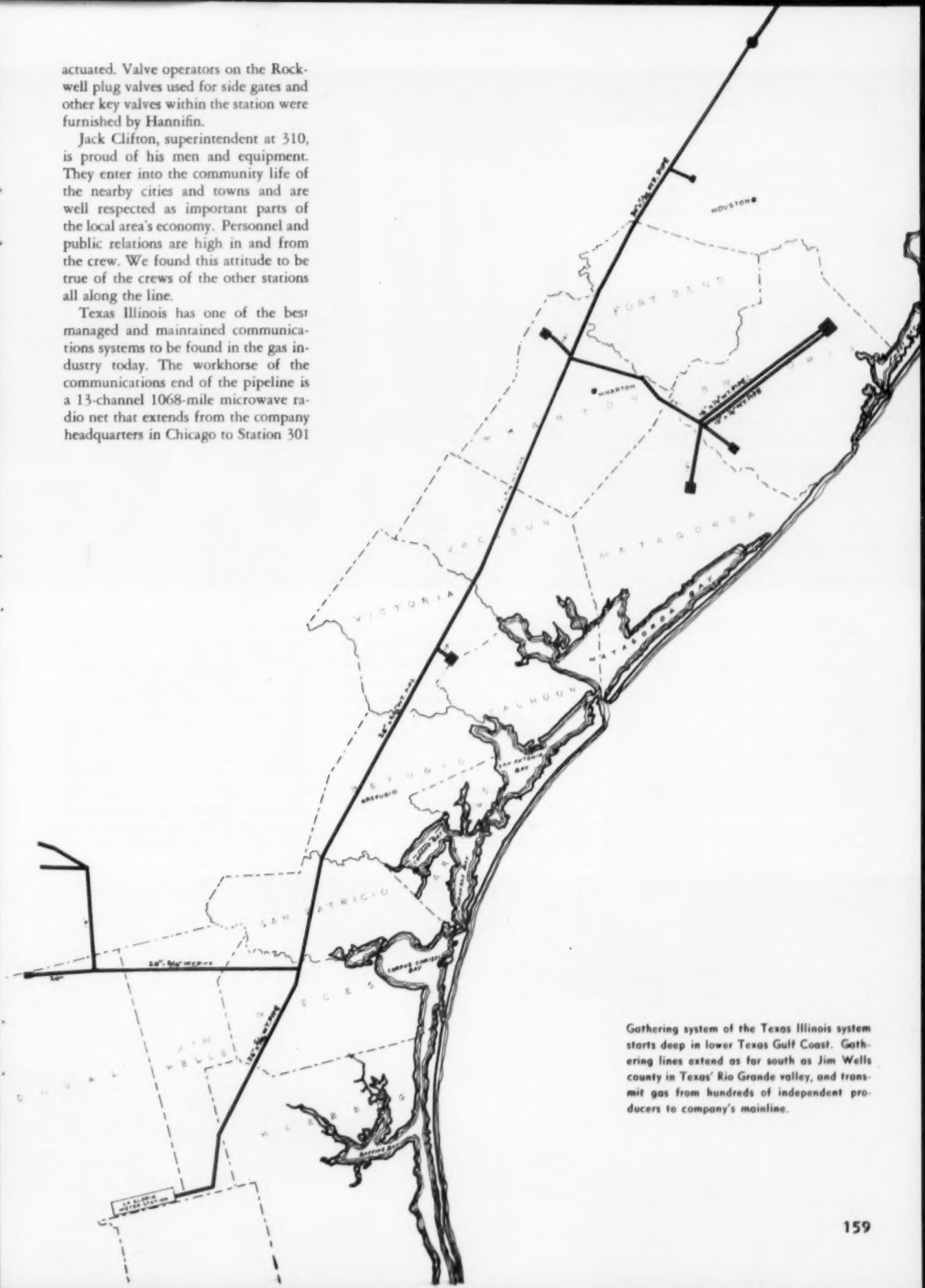
At Station 310, the cooling water for jacket and lube oil cooling is circulated in a closed system equipped with Foxboro temperature controls. Dry fin-fan type cooling "towers" are used. Three of these units are used for cooling lube oil cooling water and five are dedicated to jacket cooling water service. Auxiliaries include two air compressors for starting air — one is controlled for completely automatic service. Three Cooper-Bessemer JS8, 610-hp—500 KVA engines are available to generate station electricity. An Onan light plant is used for emergency standby power.

Semi-automatic blowdown systems are installed at the Texas Illinois compressor sites. The system is activated by opening one of two valves that are located as units in various parts of the compressor yard at strategic points. After that manual action, the blowdown systems are completely automatic. A station and station piping can be blowndown completely in less than a minute after the initiating valves are

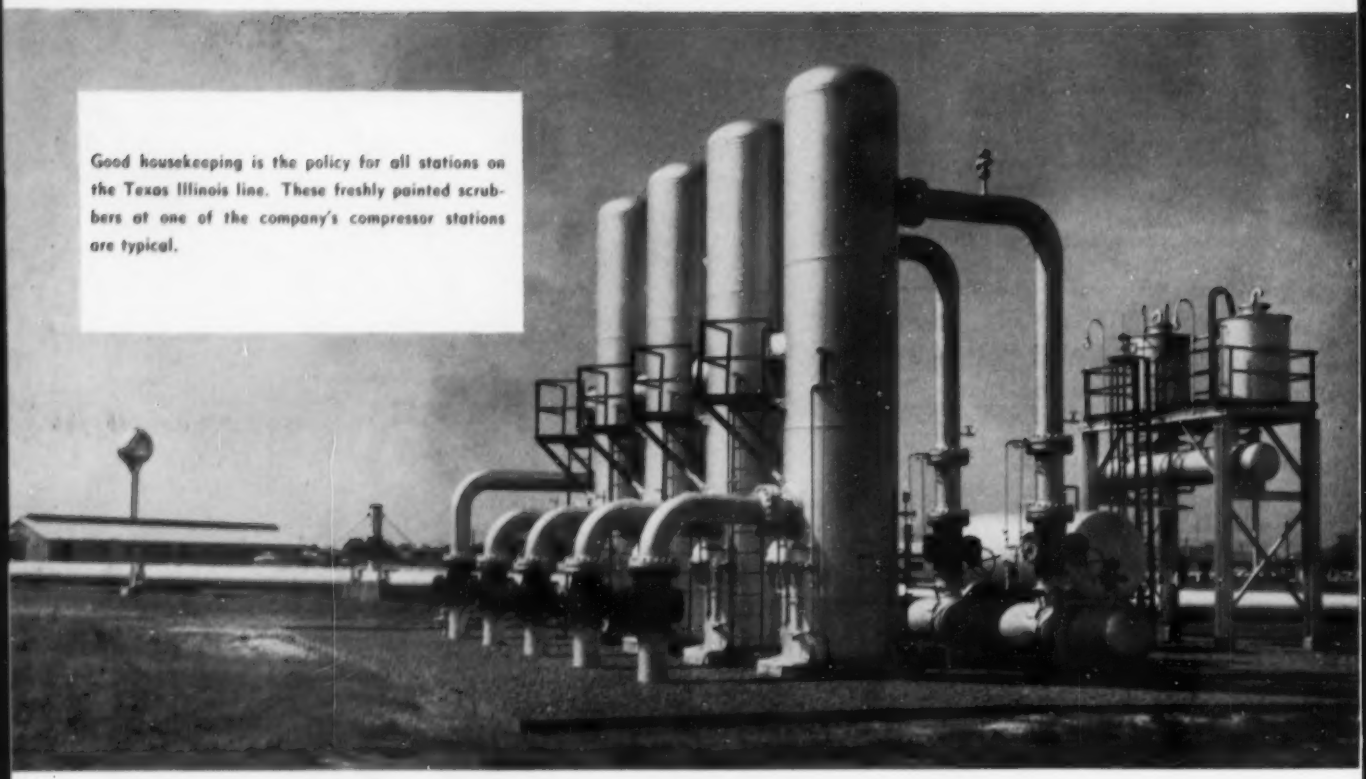
actuated. Valve operators on the Rockwell plug valves used for side gates and other key valves within the station were furnished by Hannifin.

Jack Clifton, superintendent at 310, is proud of his men and equipment. They enter into the community life of the nearby cities and towns and are well respected as important parts of the local area's economy. Personnel and public relations are high in and from the crew. We found this attitude to be true of the crews of the other stations all along the line.

Texas Illinois has one of the best managed and maintained communications systems to be found in the gas industry today. The workhorse of the communications end of the pipeline is a 13-channel 1068-mile microwave radio net that extends from the company headquarters in Chicago to Station 301



Gathering system of the Texas Illinois system starts deep in lower Texas Gulf Coast. Gathering lines extend as far south as Jim Wells county in Texas' Rio Grande valley, and transmit gas from hundreds of independent producers to company's mainline.



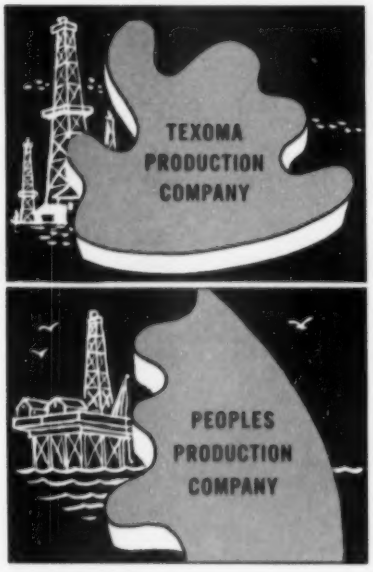
Good housekeeping is the policy for all stations on the Texas Illinois line. These freshly painted scrubbers at one of the company's compressor stations are typical.

near Wharton, Texas. Each compressor station along the line is tied in with the system and Natural Gas Storage and Natural Gas Pipeline have connecting stubs. Texas Illinois offices in Houston are also tied in. This system was made available for the first working demonstration of facsimile transmission with a microwave carrier jointly sponsored by GAS, Texas Illinois, and Motorola last summer.*

*The GAS Facsimile Demonstration, GAS, September 1955, p. 107

At Grand Tower, Ill., on the Texas Illinois Pipeline system, gas flowing toward the Metropolitan Chicago markets passes over the Mississippi river on one of the largest suspension pipeline bridges in the world. The 3690-ft suspension structure spans the mighty river with twin 30-in. OD lines. The construction of this bridge is considered an engineering feat. Near the bridge, three 20-in. underwater lines cross the river and are maintained in standby condition for emergency use. The overhead crossing is a picture that will escape from the minds of few men who have actually visited the installation. It is further evidence of the time, effort, money, and engineering that have poured into the operation of supplying gas to the Peoples Gas market areas.

One of the largest pipeline suspension bridges in the world carries gas across the Mississippi river at Grand Tower, Ill. Gas flows across 3690-ft bridge in twin 30-in. OD lines.



The search for new reserves of natural gas is a never-ending operation for a dynamic company such as Peoples Gas. Now, they have turned to offshore drilling in the Gulf of Mexico in the latest quest for more production.

Peoples Production explores for gas in Gulf of Mexico

EXPLORATION for, development of, and production of natural gas is the least known phase of the gas industry's operations. Many gas industry people limit the industry to transmission and distribution, but exploration and production are increasing in importance as routine factors in the lives of integrated gas companies. The exploration activities of gas companies range from Canada to the offshore regions in the Gulf of Mexico.

One of the companies in the highly speculative offshore exploration frontier is Peoples Production Co., a wholly owned subsidiary of The Peoples Gas Light & Coke Co. The production company was organized in 1954 to explore for oil and natural gas. This development is designed to fulfill the primary business and service obligation of maintaining an adequate supply of gas for Chicago and other communities in the six-state midwestern area served by utilities supplied from Peoples Gas' pipeline subsidiaries.

Venturing into the many unknowns posed by the offshore regions indicates the dynamic drive behind the Peoples Gas system. It is an area of great risk and challenge. Here, engineering and technology battle nature's most capricious forces in the search for new natural gas horizons.

Peoples Production entered into an

Peoples Production Co., in a joint venture with three other producers, are drilling test wells in Timbalier Bay, off the Louisiana coast, in search of new supplies. The joint venturers are now punching down third well from this permanent platform.

Circled area shows location of Peoples Production Co. exploratory drilling in Timbalier Bay.

agreement with Sinclair Oil & Gas Co., Sohio Petroleum Co., and El Paso Natural Gas Co. to jointly explore certain areas of the continental shelf in the Gulf of Mexico and the development of such reservoirs as may be proven. At the first public sale of offshore leases conducted by the State of Louisiana, the group (Peoples Production, et al) purchased a lease of 2000 acres in the Timbalier Bay area at a cost of over $3 million.

With Sinclair Oil & Gas as operator, the group erected a permanent drilling platform and drilled a well. This well was completed with a production of 1.68 MMcf of natural gas and 138 bbl of API 55.2 sp gr oil on a 12-hr test using a 0.25-in. choke. This well was shut-in and a second well was drilled from the same platform, but reached a TD of 13,000 ft without a commercial show.

A third Timbalier Bay well was started, still using the same drilling platform, and was encountering hard sandy shale at the 12,000-ft level in March. This well is projected for TD of 15,000 ft. The Timbalier Bay area is noted for quaking or heaving shales that have caused some lost hole troubles with these wells. These tests are located in block 15 of the Timbalier area.

Peoples Production et al, have another effort going offshore from a platform in block 175 of the Eugene Island area off the Louisiana Gulf Coast. As this was written, the well was at 5000 ft and drilling ahead. This lease was one of three picked up during the first sale by the federal government of leases in the Louisiana offshore area in federal waters. The three leases aggregated 15,000 acres and involved an aggregate bonus bid by the group of more than

TABLE 1. CURRENT LEASES

Area	Block	Acres	Cost, $ Million
Eugene Island	130	2500	$ 0.113
	139	2500	0.257
	175	5000	2.519
	181	5000	0.109
	190	5000	4.053
Ship Shoal	153	5000	5.519
Timbalier Bay	15	2000	3.127
South Timbalier Bay	76	2500	0.261
	85	2500	0.043
Vermilion	56	2500	0.207
TOTALS		34,500	$16.208

$12 million. Current leases held by Peoples Gas, et al, are tabulated in *Table 1.*

Peoples Production has invested 25% of the costs of these leases and participates to the same extent in cost of the exploration activities. The group has also paid $200,000 in dry hole money to induce the drilling of a well on a tract immediately adjoining one of its Federal leases in the Ship Shoal area. In addition, the group holds 25.5% interest in certain leases offshore from the Texas Gulf Coast.

Texoma Production Co., Natural Gas Pipeline's subsidiary, has also been offshore in its quest to establish new natural gas reserves. They participated with two other companies and drilled a farm-out offshore from Matagorda Peninsula in Matagorda county, Texas. This well was drilled to 11,843 ft without a commercial show.

Texoma produces about one-third of the gas transmitted by Natural Gas Pipeline Co. of America. This production is taken from the Panhandle field in Texas and the Guymon-Hugoton fields in Texas and Oklahoma. This company has been branching out in its search for new gas fields and has acquired leases and other rights to 118,000 unproven acres in Colorado, Kansas, Oklahoma, and Texas.

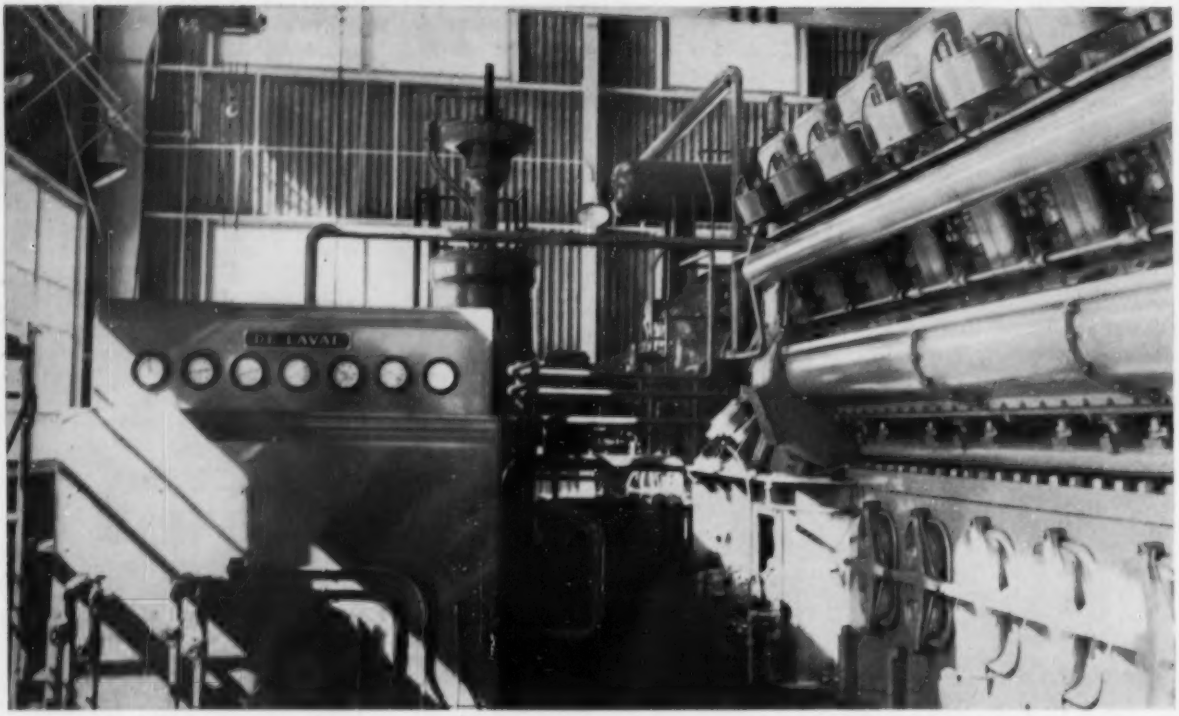
So, the search for natural gas goes on and on. Production continues to go up and up. It takes money, however, and speculative money at that, to take the risk involved with exploration. It is obvious that the Peoples Gas system is taking a long range approach to the problem of gas supply and is willing to take the risk when the technology of the exploration art indicates possibilities are in view. ■

Peoples Production Co., et al, are now in the midst of drilling a 15,000-ft well from this permanent platform in Timbalier Bay.

GAS

As this comprehensive report on The Peoples Gas Light & Coke Co. is presented, editors of GAS are now in the field gathering information and pictures of another major gas company's activities. This complete story of the company's history and operations will be presented in the October 1956 issue of GAS.

Here is an aerial view of the new drilling platform near Eugene Island. The company is hopeful of finding additional supplies of natural gas in these waters off Louisiana coast.



Compression for Transco's Station 23 is furnished by a 3000-hp, 16-cylinder, four-cycle gas engine (right) driving a centrifugal compressor (console at left). Station is located near Houston, on Transcontinental Gas Pipe Line Corp.'s mainline.

Transco uses reciprocating engine to drive centrifugal compressor

By **GEORGE B. McINTOSH JR.** • Transcontinental Gas Pipe Line Corp., Houston

Transco's new mainline booster station near Houston is unique in two ways. It is the company's first application of a 16-cylinder, four-cycle gas engine as a power unit to drive a centrifugal compressor through a gear increaser, and it is designed to run unattended for periods up to 16 hours a day. Here is how it works.

GAS exclusive

TRANSCONTINENTAL Gas Pipe Line Corp. has just put into operation a new booster station on its mainline near Houston that is a great departure from other stations on the company's vast system.

Two factors make this facility—officially named Station 23 by Transco—stand out from others.

Station 23 uses a 16-cylinder, four-cycle Nordberg gas engine as a prime mover, driving a De Laval centrifugal compressor through a gear increaser. This is one of the first applications of this combination in a natural gas pipeline compressor station. Selecting the large four-cycle engine as a driver is, of course, what makes the station unique, since centrifugal compressors are used in many instances in the pipeline industry. As the station was to be designed as a mainline booster with a low ratio of compression, it was ideally suited for centrifugal equipment. The low fuel consumption of the four-cycle engine also is attractive to the pipeline industry which, by necessity, burns as fuel gas that otherwise would be available to sell to its customers.

The engine is rated at 3000 bhp at 470 rpm. The engine crankshaft is directly connected to a speed-increasing gear set which is integral with the engine and mounted on the engine bed plate extension. The gear has a 10:1 ratio, with double helical gears and top-

mounted pinion. Driven through a flexible coupling is a single-stage centrifugal gas compressor.

The second unique feature about this station is that it is the first Transco mainline station designed to run unattended as much as 16 hours out of each 24-hr period.

Station 23 is located some 20 miles north of Houston, not far from the theoretical midpoint on the pipeline between Transco Stations 3 and 4 at El Campo and Sour Lake, respectively. It furnishes compression to the Transcontinental mainline running from the company's production area in the Texas Gulf Coast to its customers in the South and East.

The station is located on an irregularly shaped 23-acre tract with only 600 ft of road frontage. The plant site has been laid out parallel to the road, which improves the general plant appearance.

Water supply

Early in the construction period a water well was drilled to provide utility and domestic water. Electric power was purchased from the local power company which made its facilities available by extending its power line to the plant site. The compressor building is located approximately in the center of the plant area, leaving provisions for expansion to the southwest. The office building houses an office for the compressor station department personnel, an office for the pipeline department personnel and a room housing the switchboard where a glass window allows the operator to see the annunciator and other control equipment. A large warehouse has been built at the corner of the plant area. The first bay is partitioned from the rest of the warehouse and houses the shop equipment, work benches, shelving and bins. The center two bays provide storage and work space for the measurement, communications and engineering departments. The fourth and fifth bays are partitioned off and located outside the plant fence. This section is being used by the pipeline department and has a loading platform and double doors for truck access.

The meter building, water-treating building, air-fin cooler and starting air tanks all have been grouped together behind the compressor building and are accessible from one sidewalk. This compactness was designed to enable one operator to do his work with the least number of steps.

Incoming gas goes through 30-in. horizontal type scrubber before entering compressor at Transco's new Station 23. Thirty-inch discharge line (foreground) returns compressed gas to mainline running from Rio Grande valley to New York City.

The compressor building has two unique features — a truck well and a two-level operating floor. The first was determined to be the most satisfactory way of handling heavy engine parts directly from the bed of a truck to the operating floor using the building overhead crane. The two level floor was necessary because the top mounted pinion on the gear set elevated the compressor making it inaccessible from the engine operating floor. A complete basement was necessary to house all the accessory equipment as no auxiliary building has been provided. Piping design has plenty of head room to allow the operator to walk completely around the engine block in the basement, giving easy access to all equipment. The basement has two doors to the outside and one stairway to the truck well, the stairway continuing to the operating floor.

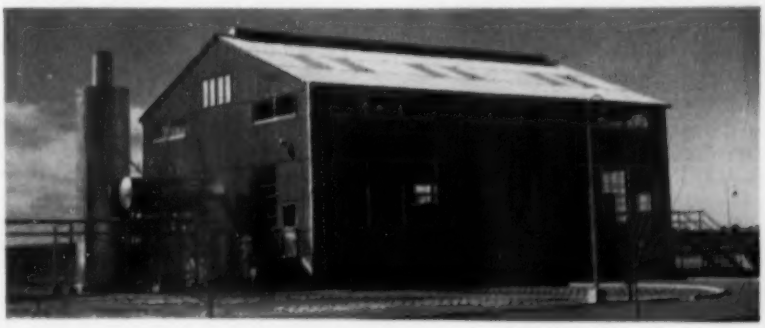
The company houses have been built at the northeast corner of the station property for the station superintendent and station engineer. Both the housing area and the plant area have been landscaped with grass, trees and shrubs.

Valve design

The mainline block valve and the suction and discharge valves are 24-in. x 30-in. plug valves with recovery tubes. Blowoff valves have been installed on the mainline and station piping which is in accordance with the design of other company stations. All yard piping is 30 in. in diameter and is reduced to 24-in. pipe in the compressor building basement. Gate valves have been installed in the compressor building and are bolted directly to the compressor case.

A horizontal dry-type scrubber has been installed on the suction line with a liquid level control to blow off any liquids or solids separated from the gas stream. A check valve has been installed on the discharge piping to prevent back

Station 23 was built by Transco on outskirts of Houston. As area will probably be residential some day, Transco equipped engine exhaust with special hospital-type mufflers and air cleaners to minimize noise.



Reciprocating gas engine... Control lines fail safe if accidentally ruptured

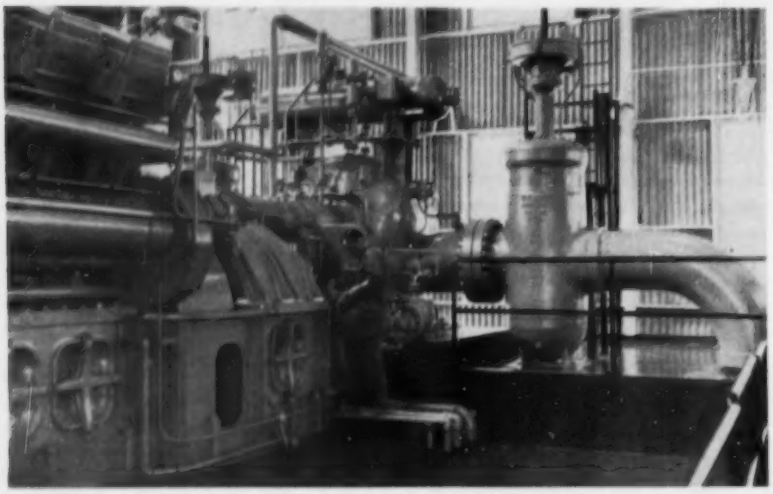
flow in the event of engine failure.

Valve operators are installed on all large valves in the high pressure gas system. These operators are used in routine operation and also are a part of the station emergency shutdown sequence which functions automatically. All operators are of the gas turbine-type controlled by high pressure gas in a network of control lines. All control lines have been designed to fail safe if accidentally ruptured.

The engine water systems have been simplified and the number of blending points reduced by using two separate systems. The hot system circulates water for cooling the engine jackets and the engine lube oil. Water from the engine jackets is circulated through a jacket water pump and split into two streams. A portion of the water is by-passed directly back to the engine jackets, while the other stream is circulated first through the jacket water cooler and then the lube oil cooler before the two streams are blended. In addition to the manual by-pass, a three-way control valve establishes a constant water temperature out of the engine.

The cold water system is used to cool in the intercooler the air leaving the turbocharger and also is used to cool the gear, compressor and turbocharger lubricating oil systems by means of shell and tube exchangers. By-passes have been installed around each of the three exchangers to control manually the various oil temperatures; but none is needed on the intercooler as the engine performance will be improved by circulating cold water through the intercooler in the winter months.

The two water systems necessitate two separate coil sections in the air-fin cooler. The unit is designed so that either of the two fans will cool both systems and each fan has a two-speed motor which results in four steps of cooling. Side stream filters of the anthrafilt type have been provided for each system and a chemical shot feeder added for water treatment.



This 3000-hp engine is the main unit at Transco Station 23. The engine drives a 30-in. impeller in the centrifugal compressor. Valve is 24- x 30-in. type with recovery tube for discharge line.

The engine lubricating oil is circulated by an engine-driven pump through the lube oil cooler and a lube oil strainer before flowing back into the engine under pressure for lubrication. To circulate engine oil before the engine has started and also after the engine has stopped, an electric motor-driven pump was installed. This pump automatically shuts off as the shaft-driven pump takes over and also starts automatically if the engine stops, either by planned shutdown or by mechanical failure, thereby assuring circulation of oil to carry away engine heat.

The gear oil system, the compressor lubricating oil system and the turbocharger oil system are all self-contained units and are not connected to the engine oil system.

All water and oil systems have standby pump equipment to allow maintenance of pumps without interrupting the station operating schedule. Some of the pumps start automatically, such as the compressor seal oil and auxiliary lube oil pumps and the engine standby oil pump. The other auxiliary pumps are not automatic but could be converted if it becomes apparent that better operation would result.

The engine oil is filtered through a waste pack side stream filter. In addition, an oil centrifuge is located in the basement for part-time service. An oil transfer pump is also available to pump oil to and from the engine crankcase and the oil sump tank.

The starting air system and fuel gas systems are conventional with most of the equipment located in the compressor building basement and the meter building. The utility and domestic water systems are equipped with pressure tanks and the utility and water well pumps run intermittently as needed. A sprinkler system has been installed in the plant yard which was laid out to water the entire plant area.

All of the basement piping has been color coded in accordance with ASA recommendations. This not only makes the piping attractive but helps the operator identify the different services. Both the operating floor and the basement floor are red topped and all the equipment is mounted on concrete foundations finished in black.

Because the station is located in an area where a population increase is anticipated, a hospital-type silencer was provided. An air intake silencer which was specifically designed to fit the turbocharger has been installed.

Electric power is purchased for Station 23 and no emergency generating equipment has been installed. The source of electricity is dependable and few outages are anticipated. All of the main switchgear is located in the office building, including the direct current batteries, which are used as part of the emergency shutdown protection. Underground conduits are run to the compressor building, dry cooler, meter building, warehouse and yard lighting stanchions. An overhead pole line has been furnished to make electricity available at the company houses. As previously noted, almost all of the au-

xiliary equipment is in the compressor building basement. This includes 15 pumps, two air compressors, solenoid valves and other safety controls.

No outside source of power is needed in the engine dual ignition system as pulse generators driven from the cam shaft provide low voltage ac current for spark ignition. This current is rectified and the low voltage stepped up by transformers which are located close to the spark plugs.

All lighting fixtures in the compressor building and meter building are the explosion proof type. The water well pump motor and the water cooler fan motors also are explosion proof as they are situated in hazardous areas.

Routine operation of the station requires a maximum crew of four men including the station superintendent during the regular work day. The station is protected throughout the night by shutdown devices and careful surveillance by the dispatcher in the company's nearby Houston office. The station is designed to run unattended for periods up to 16 hours in a 24-hr period.

Transco engineer Arvie Hamalainen checks engine operating data shown on panelboard at Station 23. Also shown is the pump starting panel, speed controller and pressure-indicating gauges.

Pressure record

The surveillance is accomplished by means of a special control board at the dispatcher's desk which includes two strip charts which record the station suction and discharge pressure at all times. This information is telemetered by means of a leased telephone line from the station. In the event of a pipeline emergency, the dispatcher can trip a switch mounted on the board and within a period of about 10 seconds the engine is stopped and the valve operators are closing the station valves, opening the mainline block valve and isolating the station from the main pipeline. Indicating lights on the control board allow the dispatcher to follow the sequential shutdown and receive acknowledgement that the sequence has been satisfactorily completed.

Many failures can occur in the station which do not affect the high pressure gas system but nevertheless are important enough to warrant a station shutdown. These failures can be detected by the dispatcher and must be handled automatically at the station. Some important engine failures such as low lube oil pressure, high jacket water temperature, low jacket water pressure and loss of instrument gas pressure, automatically shut down the engine mechanically after sounding alarms in the station and company houses. Most of the other failures, such as high gear bearing temperatures, high engine lube oil temperature, loss of seal oil pressure, mainline break, excessive discharge pressure, excessive vibration, purchased power failure and loss of dispatcher's communication, shut down the engine electrically through the supervisory control system.

All of the shutdown devices start the sequence by closing the fuel gas valve and venting the engine fuel headers to the atmosphere. The engine rapidly comes to a stop and the contacts in the centrifugal switch reverse, thereby energizing the solenoids on the gate valve operators in the compressor building, closing the valves. With the engine stopped and the mainline block valve closed, the differential Mercoid makes contact and the mainline block valve is automatically opened, allowing the gas to bypass the station.

Direct current batteries

Loss of purchased power presents an additional problem in that all electrical equipment is rendered useless. This has been solved by using direct current batteries to provide the power to operate all emergency devices needed to shut down the station. Loss of purchased power also creates the problem of losing the main and auxiliary seal oil pumps on the compressor. As the emergency seal oil tank can only supply seal oil under pressure for a few minutes, a special solenoid valve will trip a mechanism to vent the compressor case. This can only occur in the event of purchased power failure and after limit switches confirm that the unit valves on each side of the compressor are closed. Otherwise, the automatic case vent would permit high pressure gas to escape from the station and mainline piping.

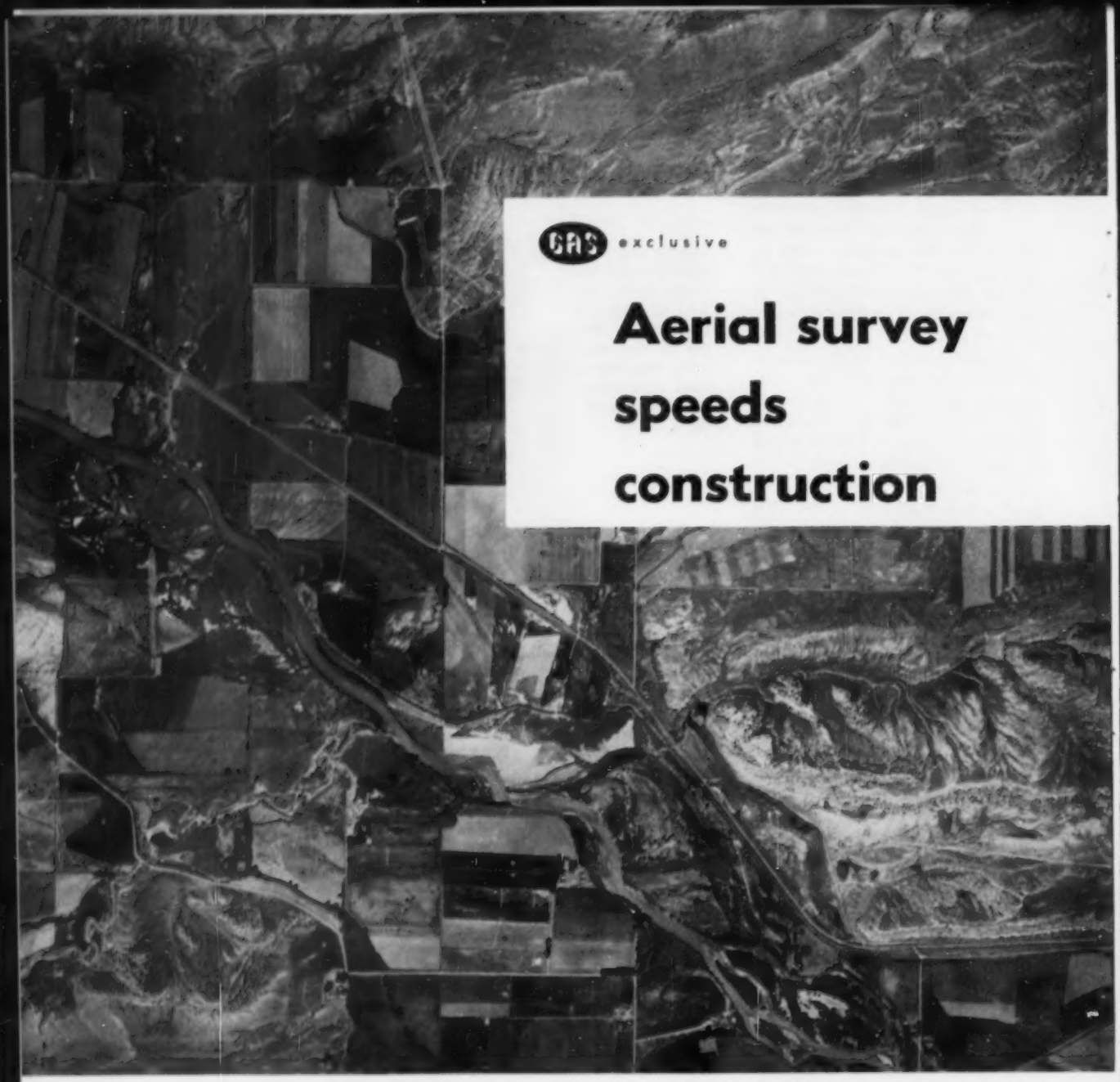
Engine speed control

Another safety device to prevent overpressuring of the station piping is a controller mounted in the operating panel which controls the speed of the engine to maintain a constant discharge pressure.

With only two months of operation under full load for practical experience, it is not possible to give a comprehensive report on the station. Later this year the operating data will be considered more reliable and a record of operating expense, dependability and equipment maintenance should be of interest. All of the engine systems have functioned as designed, and repeated testing of the shutdown devices including the dispatcher's switch in the Houston office have proven satisfactory. The station runs constantly on supervisory control with all devices ready to take over if a failure occurs without warning. ■

GAS exclusive

Aerial survey speeds construction



An aerial photo of a section of the Pacific Northwest Pipeline right-of-way, showing a river, railroad, highway, fertile farm land, and rugged badlands.

By FRED CASLER, President
Aero Exploration Co., Tulsa

THE rugged mountain country of western Colorado, southwestern Wyoming, eastern Utah and southern Idaho—route of the Pacific Northwest pipeline*—presents an almost impossible assignment for survey crews to perform on foot.

But it becomes a relatively simple job when surveyed by air.

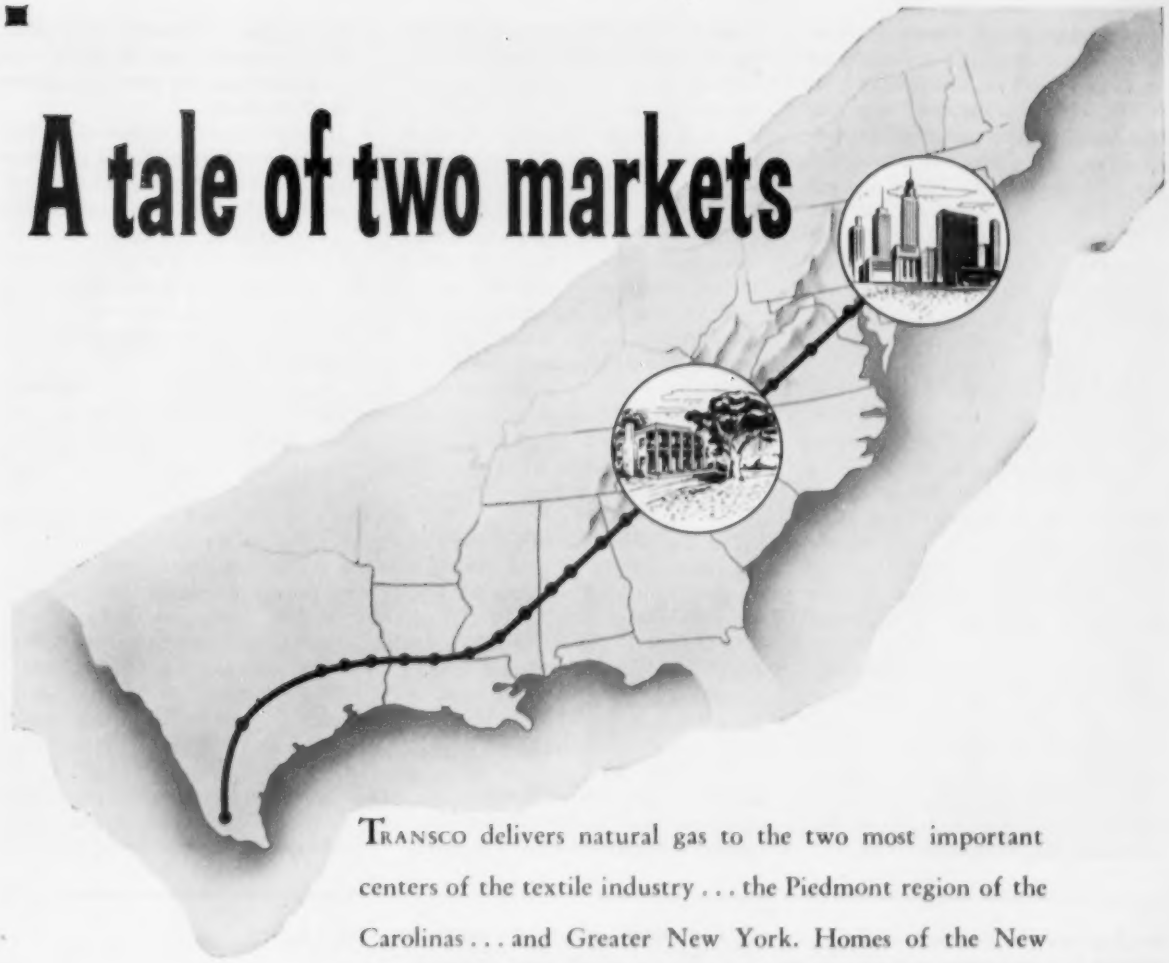
Fish Northwest Constructors Inc., Houston, builders of the Pacific Northwest pipeline, employed the Aero Exploration Co., Tulsa, to make an aerial survey of the 1487-mile route of the Scenic Inch through some of the most rugged areas in the country.

Actually, the survey is a continuous photograph, or mosaic, covering the 1487 miles. The mosaic is a series of more than 3000 separate shots, fitted together to give an unbroken picture of the entire pipeline route. It provides an accurate description, without the element of human error, of the terrain over which the line is constructed.

The right-of-way for the Pacific Northwest line lies in the heart of the Rocky Mountains. The system taps three of the world's largest gas reserves and runs from the San Juan basin in

*For a complete description of the Pacific Northwest Pipeline, see *GAS* for October 1955, pp. 67-77 and 177-216.

A tale of two markets



TRANSCO delivers natural gas to the two most important centers of the textile industry . . . the Piedmont region of the Carolinas . . . and Greater New York. Homes of the New York and Piedmont areas are particularly important markets for natural gas. At both outlets, and throughout the populous area in between, demand for natural gas is growing. Transco's pipeline is ready to help producers supply it.

HELPING TO EXPAND THE MARKETS FOR TEXAS-LOUISIANA NATURAL GAS

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

New Mexico to the Canadian border near Vancouver, B. C. It's scheduled to go into operation this summer.

The decision to use aerial surveying was based on its many advantages, which are being recognized, more and more, by pipeline companies and engineers.

No country is too rugged for an aerial survey. Over any terrain, aerial surveys are efficient, fast and economical. Over mountainous or isolated regions it speeds up the project and slashes costs.

In addition to time and cost factors, the aerial map aids in overall planning, right-of-way purchases, administration and organization.

Aero used two planes for the Northwest job. Single lens, precision aerial mapping cameras "shot" the proposed right-of-way in single takes. Each of these shots covered an area of three square miles of terrain. The overlap on each take was 60%.

To maintain an approximate scale of 3 in. to the mile it was necessary to take into consideration the elevation of the ground above sea level, adjusting the flying altitude accordingly.

The crews worked over some of the most rugged country in the West. The Arches National Monument district in southeast Utah, which is currently being meticulously explored for uranium deposits, is next to impassable for anyone on land seeking to find a right-of-way for a pipeline. However, with aerial photography, a route was quickly found.

Under ideal conditions shooting the 1487 miles could have been completed in little more than a week. However, spotted weather conditions—to be expected over such a vast area—extended the work over several months.

It is interesting to note that it took years for engineers to work out a right-of-way for the railroads, in the early history of our country, over the Rocky Mountain region. Today, Fish Engineers were able to find the easiest route in less than 90 days.

The first plane was sent to the starting point near Farmington, N. M., in August 1954. Even here clouds banked the skies almost daily, making it impossible for the planes to fly. As the job progressed toward the northern terminal point, the weather conditions became more serious. The second plane was based at Pendleton, Ore.

Although these aerial cameras are equipped with haze filters, cloudless skies and near hazeless conditions are necessary to produce quality negatives. Photographs, to achieve their maximum usefulness, must be made from top quality negatives showing complete detail of terrain.

"Soup" encountered west of the Cascade range to Sumas, Canada, prevented the planes from carrying out their mission for days. Still, these were so-called "normal" weather conditions for the region. (By normal, it is explained, crews did well to get one flying day in seven. On this day, flying time was cut down to one hour a day when skies were clearest.)

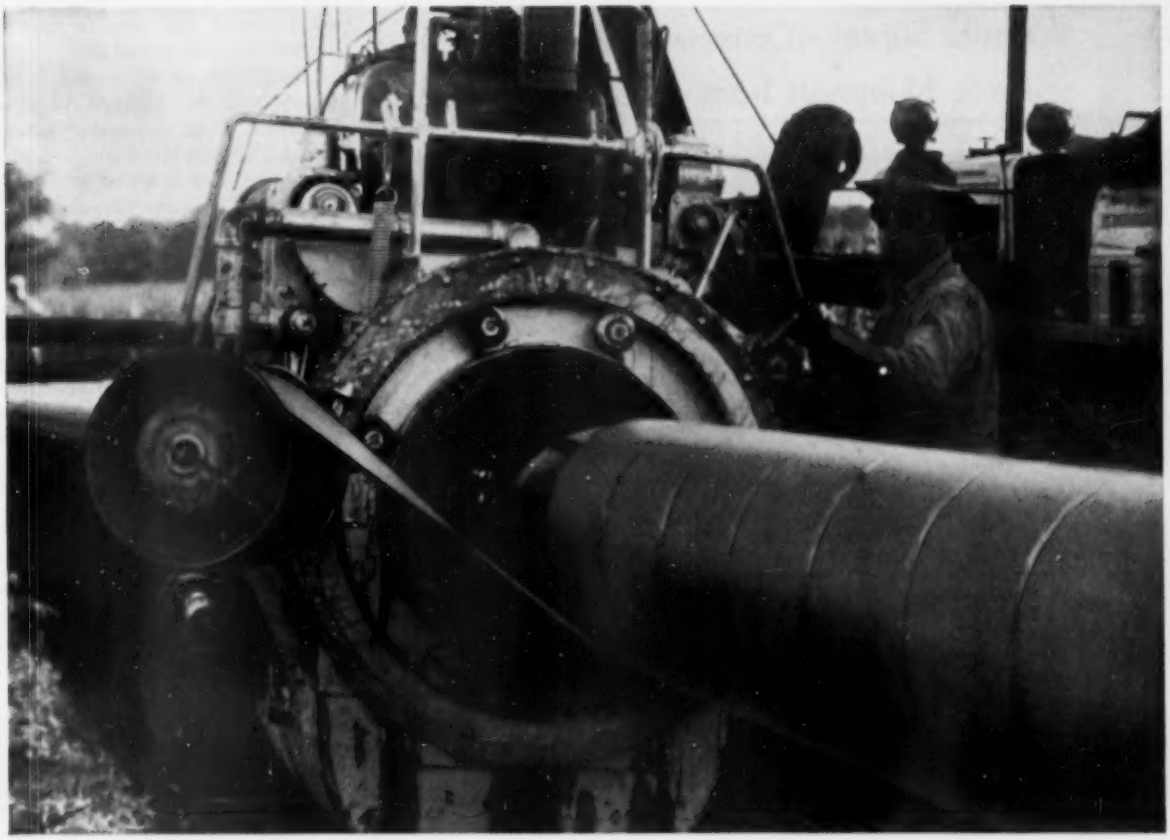
Besides the main right-of-way being "shot," a lateral gas line running from Rock Springs to Denver was done under separate contract for the Colorado Interstate Gas Co. This covered approximately 365 miles from the mainline to Colorado Springs. The main trunk and lateral will serve some 30 communities.

Actual flying operations went smoothly, except for one engine change, in spite of weather hazards.

Perhaps one of the most important technical parts of aerial mapping is the assembly of the master mosaic from the 3000 separate photos.

All of the photographs were shipped into Tulsa headquarters where trained Aero specialists prepared the semi-con-

Aero Exploration Co. photographic mapping crew, Pilot W. T. McGalliard (left) and Cameraman Roland Holmes, load equipment in North American O-47. This high altitude plane was used to survey Pacific Northwest Pipeline right-of-way.



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Name.....

Title.....

Company.....

Address.....

City.....*Zone*.....*State*.....

Aerial Survey—Constructors made blueprints from negatives

Aero Exploration Co. technicians assemble portion of mosaic showing Pacific Northwest Pipeline right-of-way.

Finished aerial survey of pipeline right-of-way looks like this when delivered by Aero Exploration to client. At left is finished mosaic of entire survey. An aerial photo of section of right-of-way is shown in center.

trolled mosaics. This takes the place of outdated mapping procedure.

Another part of the service is the preparation of the alignment negative sheet made from the master mosaic. Some 400 separate alignment negatives already have been prepared in connection with the Northwest Pipeline project.

From these negatives, the Fish Engineers produced their own blueprint reproductions as their needs dictated. The alignment sheet format was produced to the Fish organization's design. It was set up to carry not only the aerial photographic detail but also, in conjunction with the alignment detail, to carry such information as ownership, pipe detail, pump station design, profile and all other pertinent data affecting construction and administration.

In any aerial survey job, prints are delivered so that stereoscopic or third dimensional studies may be made by the engineers. Related sets of maps in identical scale can be prepared from the aerial photographs.

Aero's alignment negatives for the Northwest job cover an area of five linear miles in minute detail with a scale of 5 in. to the mile. This compares to the 3-in. scale used on the master mosaic.

In addition to the photographic work on the mainline, aerial surveys were made of 30 different communities, at large scale, for the purpose of developing municipal gas distribution systems.

Pipeline companies, gas transmission companies, contractors and engineers have discovered other varied and interesting uses of aerial maps.

They may be used in procuring easement options. They help in obtaining clearing permits of forest areas from government agencies or private owners. They eliminate trial lines and modify and cut down field decisions.

Often, the aerial map allows early action on crossing applications for highways, railroads and other cultural barriers. It serves as a reference check on field survey information. It becomes the basis for the staked route. Many have learned the aerial map is the best "headache" remedy for coordinating many-scale maps and charts.

Aerial maps enable a more comprehensive bid to be made by contractors, too.

Perhaps the best application of the aerial map is that it continues to serve for the life of the pipeline in analyzing many of its problems. ■

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Experience develops a preventive maintenance program for compressor engine magnetos

By JAMES T. CARTER JR.
Pacific Lighting Gas Co., Los Angeles

IT'S the little things that are liable to give you trouble in life or in the operation of mainline compressor stations. Magnetos are certainly a small item when compared with the size of the attendant compressor unit. But it is pretty difficult to operate a gas-fueled, spark ignition compressor unit engine when this component of the ignition system is not giving designed service. We have developed a preventive maintenance program for magnetos; it may not be the final answer, but it has convinced us of certain things.

Pacific Lighting Gas Supply Co. operates nine compressor stations spread from Goleta to Huntington Beach, Calif. Three of these are in our western division — Goleta, Ventura and Somis. The remaining six—Whittier, Santa Fe Springs, Brea, Signal Hill, Dominguez, and Huntington Beach—are in our southern division, located in Los Angeles and Orange counties. There are 132 main units with a total rated horsepower of 36,275 installed.

All the main compressor units are gas-fueled spark ignition engines. Except for 10 units at Ventura, which are being equipped with magnetos at the present time, all main units use magnetos for the spark ignition source.

One hundred of the main units are of the two-cylinder, horizontal type in the 165- to 200-hp range. Many of these units were originally equipped with oscillating or trip lever-operated, high-tension magnetos and, for the most part, have been converted to the use of rotary high tension magnetos. The auxiliary pumps, air compressors, generators, etc., are also driven by gas-fueled engines using magneto ignition. There are 94 auxiliary power units with a total rated horsepower of 4301.

We established our own magneto repair shop five years ago. Prior to this, servicing rotary magnetos consisted of an occasional check or replacement of the points. If this didn't keep the magneto operating, it was sent to an outside service shop.

Replacement parts became more and more difficult to obtain. Salvaged parts from junked magnetos were used to repair other obsolete magnetos. This work was done at the stations by station personnel. One of the men doing this salvage and service work had an aptitude for, and an exceptional interest in, magneto repairs. Beginning in 1949, this mechanic at our Huntington Beach station performed all maintenance and repair work on all magnetos used at that location. Use of the outside service shop was discontinued. With existing station equipment and a few inexpensive parts, a simple magneto test stand was assembled. Data for magneto service were gathered from various locations, principally the magneto distributors and manufacturers. During approximately two years of experimenting and keeping accurate records of repair data as related to running time, the basic program for preventive maintenance was developed at this station.

The next step was to confirm that magneto operating conditions at the various stations were uniform enough to permit comparisons. We have not necessarily reached the final answer in our selection of ignition system components. Through trial-and-error experimentation, we have adopted, on a system-wide basis, those items and procedures that have demonstrated their ability to minimize difficulties and failures. The maintenance mechanics are aware of the importance of maintaining the entire ignition system—spark plugs, high and low tension leads and transformer coils—in best condition.

Our equipment consists of relatively few types. The main units are either older low speed (180 to 200 rpm) horizontals or more modern higher speed (300 to 330 rpm) angle types. The auxiliary power units are, for the most part, various models of one manufacturer's engines. Thus, representative models of both main and auxiliary equipment are installed at Huntington Beach station.

Because of the similarity of equipment and uniformity of service conditions, the preventive maintenance program developed at Huntington Beach station could have been used at all our stations in 1951. Data on annual costs of magneto repairs, including such minor adjustments as were performed by station personnel, were not readily

TABLE 1. Service Conditions Warranting Inspection and Maintenance Periods

Service Class	Maintenance Period: Minor Overhaul	Maintenance Period: Major Overhaul
Class I—High Tension 1800 rpm +.....	1 month	1 year
Class II—High Tension 800 - 1700 rpm.....	2 months	1 year
Class III—High Tension Less than 800 rpm.....	1 year	3 years
Class IV—Low Tension 600 - 1000 rpm.....	None	1 year

This article has been adapted from a talk presented at the fall meeting of the CNGA in Los Angeles, Oct. 13-14, 1955

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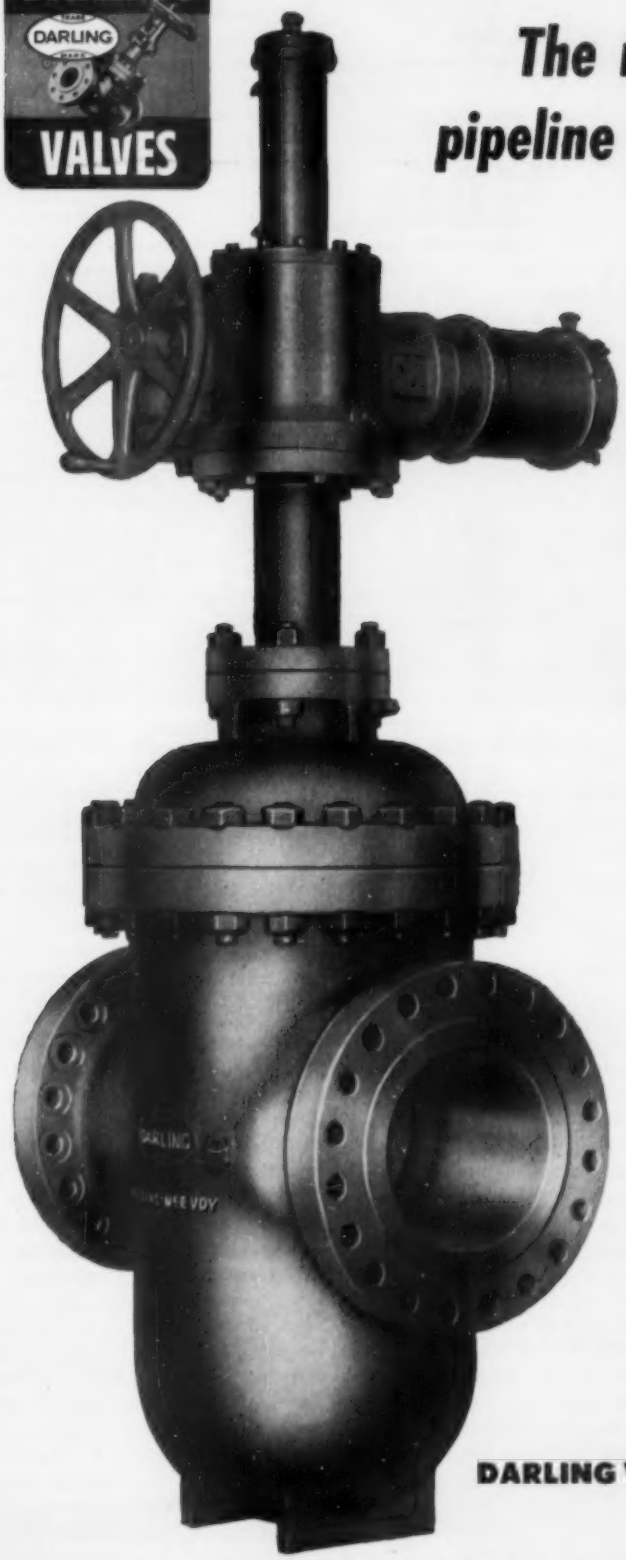

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Write for details

Ask for bulletin #5402 which contains complete information on the design and operation of this valve.

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Engine magnetos...For convenience, calendar periods are used in maintenance schedules

available. Also, we had almost eliminated the use of the older magnetos in 1951, at least at our more active stations. Comparison of 1951 and later costs with pre-1951 costs might have given a distorted picture because of comparing modern rotary magnetos with obsolete types. Therefore, we used the preventive maintenance program at Huntington Beach and continued our previous practices at the others to accumulate data for comparable magneto equipment.

During the next three years, minor revisions in the preventive program were made, mainly in extending the period between servicing. The present magneto maintenance program establishes four separate service conditions, which, in turn, establish the repair periods for each magneto. The repair periods are based on actual operating time. For convenience, calendar periods are used in our maintenance schedules. However, units are seldom shut down for the sole purpose of servicing the magneto and actual service occurs at approximately the periods shown in the schedule.

Table 1 is a chart showing the service conditions that warrant different inspection and maintenance periods, and shows the periods at which minor and major overhaul jobs are performed. These service conditions are classified by relative severity of the service as Class I, II, III, and IV. The table indicates the items upon which we base our severity-of-service classification. While these classifications are sufficient for our purposes, different equipment or the same equipment operating at other speeds or load conditions may require different frequency of maintenance.

Our most severe service, Class I, is for a high tension magneto operating at or above 1800 magneto rotor rpm. As limited by our type of equipment in service, all magnetos in this service are high tension, carbon-brush distributor type, installed on automotive-type four-cycle engines. Typical of this service is an American Bosch MJA magneto on a six-cylinder engine operating at 1200 rpm or above.

Following this same pattern, our next most severe service, or Class II, is less severe because of lower mageto rpm. For our purposes, the magneto speeds here range from 800 to 1700 rpm. Typical of this service are high tension magnetos on six-cylinder engines operating at 800 to 1100 rpm, or on four-cylinder engines operating at 800 to 1200 rpm.

Class III service covers those magnetos operating at 800 rpm or less. Included in this class are approximately as many magnetos as the other two high tension service classes combined. Typically, this service covers magnetos installed in our older horizontal units, operating at 330 to 400 magneto rpm. For the most part, these are now American Bosch MJ type.

Class IV service includes all our low tension magnetos. These are installed on the new-type main units and operate at 600 to 1000 rpm, depending on the number of cylinders on the unit and the engine speed (300 to 330 rpm). As mentioned earlier, we are replacing the battery ignition on our Ventura main units. These new magnetos operate at 360 rpm and are all of the low tension type. They will be treated the same as the existing higher-speed low tension units unless actual operation shows that the service period can be lengthened. All except four of these are the Bendix LA type.

As a sub-class in Class I, we also include those magnetos that normally would fall into Class II, but which, because of periods of inactivity, require more frequent attention. This occurs where we have 100% standby, as is usual for air compressors and some pumping services. With 100% standby, we ordinarily operate the units alternately for periods of one month each. After one month of running time, sufficient carbon dust and dirt have accumulated in the magneto so that moisture may accumulate and cause the magneto to fail to perform, or may cause hard starting. Since these units are normally checked and the oil is changed at the end of the month's running time, only a little more time is required to install a reconditioned magneto. This assurance of easier starting in case of emergency need for the unit is well worth while.

The repairs and maintenance performed fall into only two categories. The most frequent maintenance, or minor overhaul, requires only a minimum of dismantling of the magneto, unless its condition warrants further inspection and repair. The maintenance performed on the second, or major overhaul, consists of completely dismantling the magneto in addition to performing the maintenance accomplished on the minor overhaul. A list of the inspections and adjustments made on minor and major overhaul includes the following items:

DATE_____ MAGNETO INFORMATION MAG. NO._____

NEW MAGNETO INFORMATION

Sta. No. _____ PLOSCo. No._____ Type_____ Model_____

REPAIR RECORD

Date Repaired_____ By_____

Materials Used:	Cost:
	$
Total cost of materials used	
Labor: _____ Hrs. at $_____ per hour	
TOTAL COST TO REPAIR MAGNETO	

TRANSFER RECORD

Date of Transfer_____ From_____ To_____

Recorded_____ Signed_____

PACIFIC LIGHTING GAS SUPPLY COMPANY MAG NO._____

MAGNETO REPAIR RECORD

MAKE_____ MODEL NO. & STYLE_____ FACTORY NO._____

DATE REP.	COST MATL.	COST LABOR	REPAIRED BY	REMARKS	DATE OF TRANS.	TRANS. FROM	TRANS. TO

Fig. 1. Form for reporting costs of repairs (left), both outside and company performed, to operating department. Fig. 2. Master record card (above) maintained in office for each magneto.

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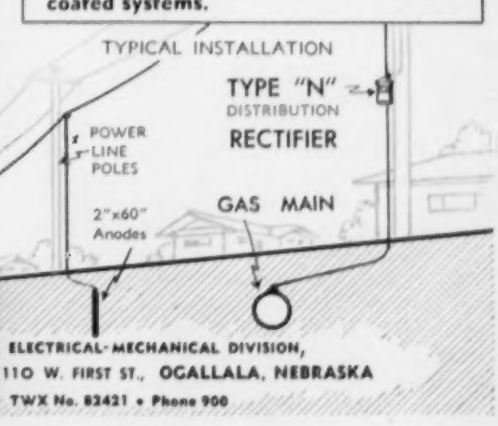

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Minor overhaul

1. Clean the exterior.
2. Remove the distributor plate and points.
3. Clean the interior made accessible by removing the distributor plate and points.
4. Clean and inspect the brushes and rotor.
5. Dress the points and inspect the cam for wear.
6. Check the condenser with instrument.
7. Reassemble the magneto, setting point gap and lubricating the cam wick and cam.
8. Remove the impulse coupling, clean, inspect and reassemble.
9. Run magneto on test stand checking:
   a. Primary output.
   b. Edge gap distance setting.
   c. High tension output.
   d. Impulse operation.

Major overhaul

1. Clean the magneto exterior.
2. Install the magneto on the test stand and check:
   a. Impulse operation.
   b. Output of primary and secondary.
3. Completely disassemble and clean the magneto including removal of the magnet rotor and impulse coupling.
4. Inspect bearings.
5. Test coil for opens or shorts.
6. Test condenser.
7. If primary output were low on test run and coil is all right, recharge the magnets.
8. Inspect the distributor rotor and resurface or replace as required.
9. Repack the bearings and reassemble the magneto using new or reconditioned parts as needed.
10. Install the magneto on the test stand and recheck the output.
11. If condition of the exterior indicates the need, repaint the exterior (lacquer).

The low tension magnetos require much less maintenance than the high tension magnetos. In fact, our experience indicates that dressing the primary points and distributor points would be sufficient for annual servicing. However, in order to reach the distributor points, the magneto must be partially disassembled. Therefore, each overhaul of the low tension magnetos is comparable to the major overhaul on high tension magnetos.

This program has been developing since 1949. Starting in 1951, accurate records were kept of all magneto maintenance expense by station and magneto. One point, which was uncovered during preparation of this article, indicates that for stations using outside service shops, all station labor on magnetos may not have been included in the reported cost data. This would cause the previous maintenance program to look better cost-wise than it now does. Since each station was charged with the responsibility for determining when maintenance was required, no central control was imposed on the frequency of service. Cost of repairs, both outside and company performed, were reported to the operating department office on a form developed for this purpose. This is shown in *Fig. 1*. The form has two additional uses: (1) to report to the office the type and installation number when new magnetos are placed in service, and, (2) reporting to the office when magnetos are transferred between stations.

Fig. 2 shows the master record card maintained in the office for each magneto. On it are recorded the cost of repairs as they occur and are reported to the office.

A compilation of the costs incurred over the past three years is shown in *Table 2*. The costs for Huntington Beach station are for preventive maintenance, while the other three stations used outside service without preventive maintenance. Since major overhaul occurs on a running time basis and the load factor at Huntington Beach is 68-74%, each calendar year may not include an equal number of such major overhaul jobs. This is the case because a number of repair jobs, and thus repair costs, fluctuate widely from year to year on a calendar year basis. Therefore, total costs for the three-year period were used for comparison.

This compilation covers only the modern rotary magnetos since the few older-type magnetos show costs of maintenance out of proportion to their number and actual service. These older magnetos have been retained in service because they are installed on equipment which is in standby condition. Until such time as continuous operation of this equipment justifies replacement, these old magnetos will be retained as long as they can be made to function.

From *Table 2*, Class III service covers 50 operating units, while Classes I and II combined cover 38 units. These data are based on the cost of magneto repairs required to accumulate the unit operating hours shown under "Total Operating Hours." Thus, the 50 Class III service units require approximately 55 magnetos to provide sufficient spare to permit removing magnetos for periodic service in the repair shop. About 10% spare magnetos are provided for the Class I and Class II service.

The data indicate that no magneto repair cost savings are made for Class I and II service. Our cost, with or without preventive maintenance, was approximately 2.5 mills per operating

TABLE 2. Compilation of Costs in Three-Year Period

Class I and II Service

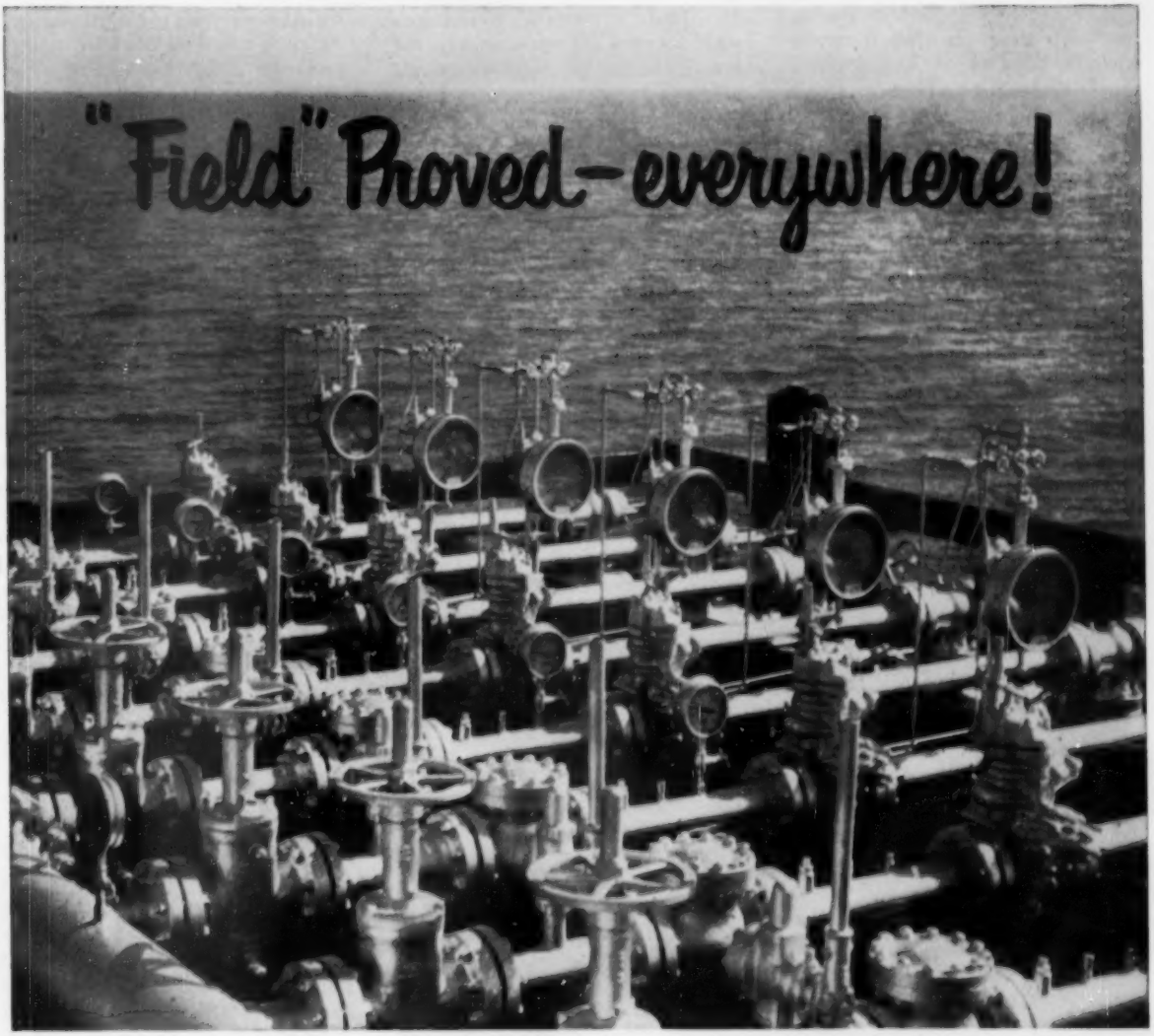
(3-Year Period—1952 to 1954 Inclusive)

	Signal Hill	Brea	Ventura	Huntington Beach
Number of units	7	4	11	16
Total operating hours	144,629	122,503	227,810	287,928
Load factor (operating hours as percent of possible)	78.6%	87.4%	79.8%	68.4%
Number of magneto repairs	16	17	45	186
Total cost of repairs	$350.90	$212.22	$552.80	$711.79
Average cost per repair	$21.90	$12.50	$12.25	$3.65
Cost per operating hour (mils.)	2.43	1.73	2.43	2.47

Class III Service

(3-Year Period—1952 to 1954 Inclusive)

Number of units	16	8	0	26
Total operating hours	126,246	122,750	0	508,719
Load factor (operating hours as percent of possible)	30.0%	58.4%	0	74.4%
Number of magneto repairs	5	12	0	62
Total cost of repairs	$100.17	$117.40	0	$226.57
Average cost per repair	$20.03	$9.79	0	$3.66
Cost per operating hour (mils.)	.793	.956	0	.446



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hour. Brea costs were lower because all four units there are Class II service while the other stations have approximately 20% Class I service.

Maintenance pays

The average cost per repair with preventive maintenance (Huntington Beach) of $3.65 is less than the standard labor charge made by outside magneto shops. Our experience has been that most shops make a flat charge for labor, which amounts to approximately $6. Thus, preventive maintenance could not show any cost savings for our operations. The 186 repair jobs would have cost $1100 for labor only if performed by outside shops, or about 4 mills per hour against our 2.5 mills average cost.

The advantages of, and cost savings because of, uninterrupted service are sufficient to make preventive maintenance desirable for these two services. Continued accumulation of data may show a slight decline in preventive maintenance costs per operating hour owing to spreading all major overhaul costs over a full 8760 hours per magneto for these Class I and Class II services. Some of these magnetos may not have accumulated a year's operation since the last overhaul.

For Class II service, the cost per operating hour with preventive maintenance is approximately one half the cost without preventive maintenance — 0.446 mills per hour vs. 0.8 to 0.9 mills. The actual repair cost savings indicated for the 26 units in Class III service with preventive maintenance, approximates $210 for the three-year period covered. This indicates that $110 less could have been spent on the 24 units not covered by the program during this three-year period. Projecting these figures into the future (0.446 mills vs 0.874 mills), our current and probable load factors indicate that we should spend approximately $125 per year less by having the preventive maintenance program for the 50 slow-speed magnetos in Class III service covered by this study.

Savings great

For Class III service, our cost of preventive maintenance is about 60% of the cost of repairs performed by outside shops for the stations not using preventive maintenance. Again, the cost of our preventive maintenance program, if repairs had been performed by outside shops, would have been about $375 for labor alone, or approximately 0.7 mills per hour. With the inclusion of replacement parts, the preventive program would have cost as much per hour as, or more than, the non-preventive program.

Since we had only 18 low tension magnetos in operation during the 1952-1954 period, and only one of these was covered by the preventive maintenance program, no valid cost comparisons can be made for our operations. In general, our low tension ignition systems require much less maintenance than our high tension systems. In addition to the advantages inherent in low tension systems for some applications, the basic design features of our low tension magnetos eliminate some causes of magneto failure.

The cost reduction goes hand in hand with elimination of unscheduled shutdown of equipment due to magneto

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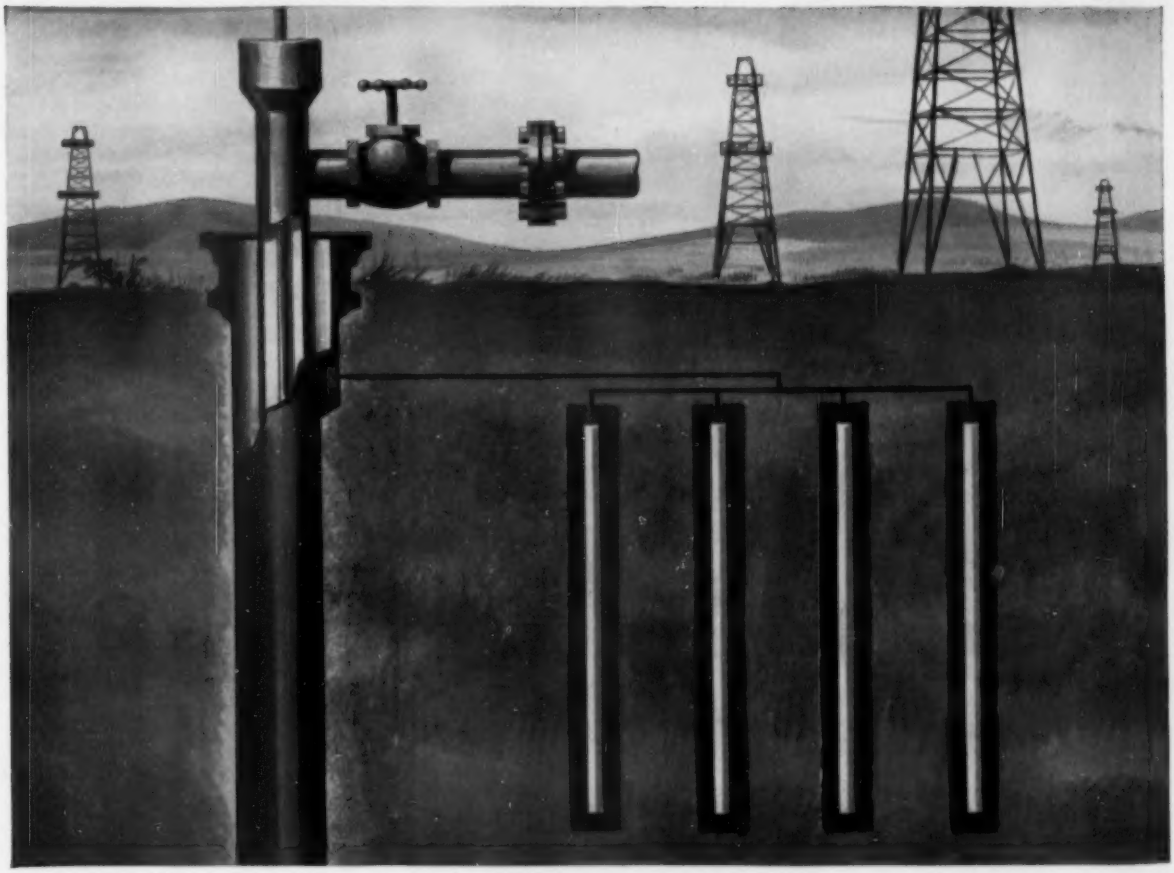

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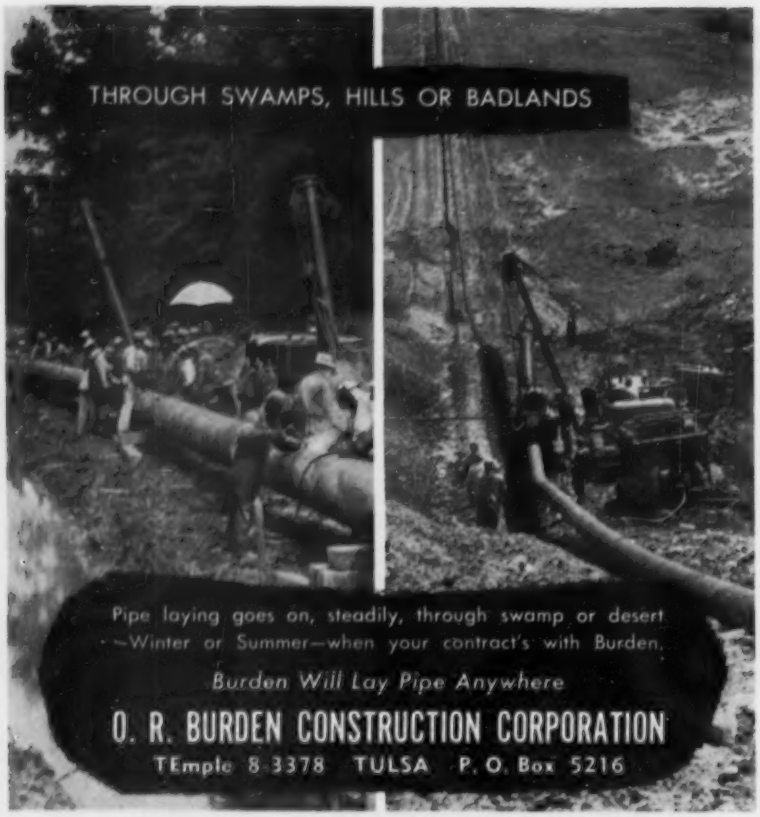
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failures. Since 1950, occasions of magneto failures during operation for all four classes of service at Huntington Beach station have been eliminated. Because of the reduced costs of magneto repairs and elimination of the tangible but hard-to-determine expense caused by magneto failures, this preventive maintenance program has been expanded to include the six stations in our southern division. We have supplied our magneto shop with equipment designed for use in magneto repairs, doing away with the home-made, make-shift equipment. Magnetos for approximately 100 units are serviced at this shop. Our magneto maintenance mechanic spends 50% or less of his time on magneto repairs. The balance of his time is spent as a mechanic working on engine and compressor maintenance. Unless the magneto maintenance can be performed by a general maintenance mechanic, or the work load is approximately twice our magneto maintenance load, it would be uneconomical to set up a magneto repair shop. The magnetos from our western division stations are not sent to the shop at Huntington Beach because of the distance and time involved. A similar program of maintenance will be provided for these three stations.

Conclusions

In conclusion I want to repeat that our preventive maintenance program, developed by trial and error, convinces us of these things.

1. Cost reduction can be realized by preventive maintenance.

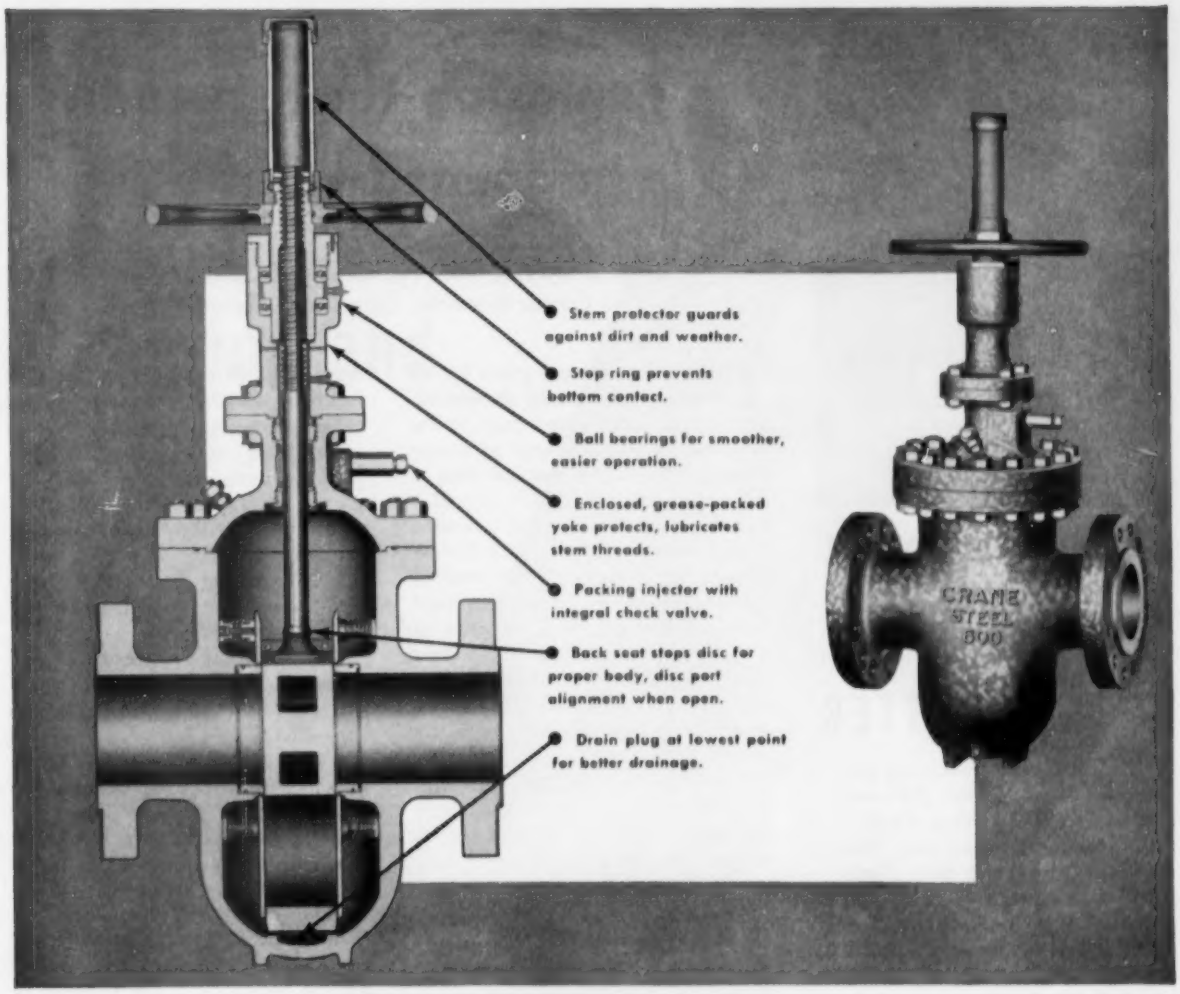
2. Equipment shutdowns due to magneto failures can be almost entirely eliminated.

3. Magneto service, including minor inspections and setting point gaps, should be performed by a mechanic trained and skilled in magneto repairs.

4. It is not economically feasible to set up a preventive maintenance program for an operation the size of ours using outside labor.

5. To justify a full-time magneto repairman would require at least twice our magneto maintenance load.

I highly recommend that operations involving 100 or more magnetos be surveyed to determine the feasibility of a preventive maintenance program if only on the basis of providing dependable magneto service. ■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An explosion that shouldn't have happened — but did

By R. L. BOYER, Vice President and Chief Engineer
The Cooper-Bessemer Corp., Mt. Vernon, Ohio

THE substitution of oxygen for nitrogen in a laboratory test procedure was the fundamental cause of the explosion in our laboratory in Mount Vernon, Ohio, which took the lives of three men and seriously injured a fourth. Despite the fact that it became evident within moments after the explosion that oxygen must be involved (simply because we knew there could be no other origin for an explosion of that character), many incorrect reports appeared in print soon afterward. One such report was that a centrifugal compressor blew up. This was completely untrue.

It was later determined with certainty that the cylinder of compressed gas being used at the time did contain oxygen. The investigation which substantiated this finding is now complete.

The important part of this finding is the manner in which the substitution occurred. Lack of suitable standards is responsible. Our main interest now is to lead the way in bringing about certain standardizations, backed by laws and regulations, if necessary, whereby this type of accident can be prevented. We have taken every possible step to make certain that such a substitution cannot occur again at Cooper-Bessemer.

The company, along with all other users of bottled gases, purchases these gases from manufacturers and distributors. In our case these manufacturers with their distributors are large, nationally known and reputable concerns. But they presently operate without nationally enforced standards and regulations.

For various laboratory tests, we use different gases such as nitrogen, helium, hydrogen, etc., depending upon the requirements. For the particular laboratory test we had undertaken, we could use either nitrogen or helium as both gases are completely inert and safe. We generally use nitrogen but during the morning of the day of the accident we had been using helium because we had exhausted our supply of nitrogen.

Before the test, we ordered three cylinders of nitrogen from one of our suppliers. To save time, our own truck picked up these three cylinders at our supplier's warehouse. Our driver loaded the cylinders, but they were the ones designated by the supplier. Our driver did *not* make an error.

We now know that the three cylinders he picked up contained oxygen.

The first of these three cylinders was connected to the test machine at 11:40 a.m. The connection was made properly by a qualified employee under supervision of the head of the department. The explosion occurred at 2:18 p.m. The only reason it did not occur at 11:40 a.m. is that the case of the test machine contained helium and it required some time for the percentage of oxygen to reach a point where it would become hazardous in the presence of the lubricating oil.

We know of no cases throughout the country, prior to our accident, where anyone analyzed such gases before use since everyone is dependent upon the manufacturer and distributor delivering what is specified. This case is analogous to the purchasing of a prescription in a drug store where we find it totally unnecessary to employ a chemist to determine whether the contents of the prescription might be poison.

There are really four possible means of identification of the contents of a gas cylinder:

a. Knowledge that the order has been filled as requested.
b. The name of the gas on the cylinder.
c. The type of connections to the cylinder.
d. The color of the cylinder.

Years ago a so-called "standard" was adopted by the Compressed Gas Asso-

Continued on page 187

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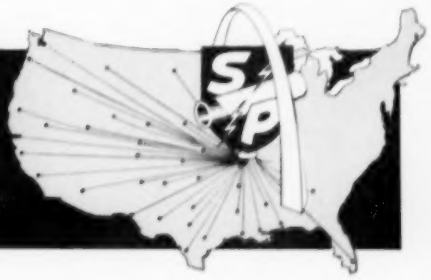

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Continued from page 184

ciation for identifying the contents of a compressed gas cylinder by painting on the name of the gas on the cylinder in letters not less than ⅜ in. high. The application of this standard, however, had been left to the discretion of the individual manufacturer. Experience shows that not always are cylinders identified at all with the name of the gas on the cylinder. The cylinder which caused our explosion carried no such identification.

Similarly, there are standards agreed upon by the Compressed Gas Association as to the connections on the cylinder regarding inert and combustible gases like nitrogen and oxygen. Some manufacturers have different connections, so that when the cylinder is used this connection is a warning. Other manufacturers do not have the different connections and our people, therefore, have been accustomed to receiving nitrogen cylinders with the same kind of connection as used on oxygen cylinders. The cylinder which caused our explosion had an oxygen valve and connection.

A widely used method of identification is the color of the cylinder. Here no standard has been adopted by the Compressed Gas Association, but the individual manufacturers try to adhere to their own color schemes for their own individual convenience. Different manufacturers have different colors. In this investigation we have noted, for example, that one manufacturer uses the same color for his oxygen cylinders as is generally used for hydrogen. The worst possible combination of gases would be the union of these two. The U. S. government has a color standard in successful use. The confusion regarding color was largely responsible for our accident.

In the case of the manufacturer with whom we deal, a standard color is used for nitrogen cylinders quite different from the oxygen cylinders. Therefore, it was not plain in the beginning of this investigation how the supplier could possibly interchange them. It was definitely not a case of filling a nitrogen cylinder with oxygen.

Many privately owned contracting companies as well as oil and gas field operators own their own cylinders in order to avoid demurrage. Quite naturally, in practically all cases, such users are concerned only with oxygen and acetylene for welding and cutting operations. The shocking part of this practice is that these individual concerns paint their own cylinders with any color they choose for easy identification. They, of course, send these cylinders in to distributors and manufacturers for filling. Large manufacturers cannot very well refuse to fill their cylinders because it probably would be considered restraint of trade if they refused to do so.

Unfortunately there are no regulations about the color or identification of cylinders when they are filled. In this particular case a contracting firm, which is not involved in any way in this explosion, had sent in to the distributor who in turn sent to the manufacturer, three cylinders with no identification whatever except a coloring that happened to be similar to the coloring used by that particular manufacturer for nitrogen cylinders. They were to be and were filled, with oxygen. They were then returned to the distributor and in specifying the cylinders to be taken by our truck driver the error was made because of the similarity of appearance. The three nitrogen cylinders ordered by us were still in the supplier's warehouse.

This type of substitution and type of accident could occur at any time anywhere in the country unless standards and regulations are adopted that would make it practically impossible. The amazing thing is that we can find only one other case where this type of accident has occurred in the past where oxygen has been supplied where nitrogen was specified. There are cases where nitrogen has been substituted for oxygen which industrially could cause no damage but which in a hospital would be disastrous to a patient.

We know of no safety precautions that could have been taken which could have prevented this disaster, except an actual analysis of all gases. One item that has been pointed out is that we possibly could have had relief valves on the machine for protection. We want it thoroughly understood that this was an explosion and not a rupture due to operating pressure. No known relief valve could possibly have protected anything against such an explosion.

As matters now stand, the report of the explosion has been submitted to standardization committees for their study and action. Our pledged purpose is, of course, to further every possible precaution until the substitution of compressed gases and their resulting explosions become absolutely impossible. ■

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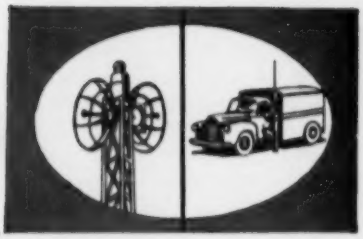


By FRANK CHAPMAN

San Diego expands internal telephone systems

A UNIQUE plan of decentralization and specialization characterizes the three separate, privately owned, internal telephone systems operated by the San Diego (Calif.) Gas & Electric Co.

The systems, manufactured and installed by the Automatic Electric Co., have been gradually built up over the years. They serve all departments of the company, and make use of some of the very latest in communications techniques such as the company's recently installed microwave system. (See GAS, August 1955, p 127.)

The plan of decentralization is evidenced in the manner in which the three complete internal systems are operated and there is no provision for interconnection between them. Each has been designed for a single separate purpose and is used for that alone.

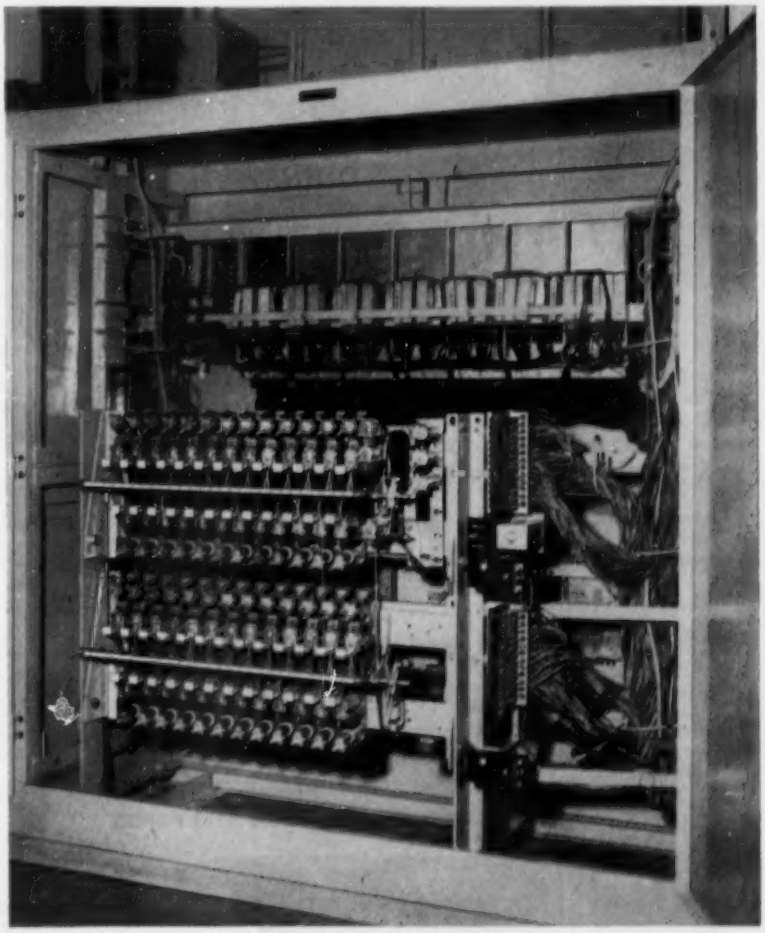
One system is used solely for executive and commercial department functions. This system was installed as a part of the company's new microwave system. It is an automatic dialing system and makes use of four microwave channels, two between the company's business office in downtown San Diego and each of two major outlying offices, plus a conference channel common to the whole system.

A second complete system serves only the electrical production department. This system is basically for communication between the company's generating plants. It also makes use of two microwave trunks between San Diego and a new major generating plant several miles north of the city.

The third system serves the company's operating functions such as transportation, stores, transmission, distribution and gas departments. This particular system was just recently expanded from a 12-line system using four microwave channels to a 50-line system making use of six microwave channels. The conversion also included the installation of a fully automatic dial board, replacing a manual system. With this installation all three of the company's internal telephone systems are now automatic.

An executive right-of-way control has been installed on the system used by load supervisors to permit them to take over a busy circuit at any time it is found to be necessary. The installation consists of a priority switch mounted on those telephone sets used by the load supervisors. If the supervisor finds a dialed number to be busy, he only need to operate the switch to take over the circuit.

The theory of a separate, non-interconnected internal telephone system for each of the company's major func-



This is a view of the working mechanism of the cordless dial board now used by San Diego Gas & Electric Co.

tions has proved to be a worth while one for the San Diego company. Each function has its own problems and needs, requiring a somewhat different type of telephone service. In addition, with each department having its own system there is no problem of interdepartment tie-up of the systems.

All three of the company's telephone systems have been considerably expanded and made more useful through the use of microwave. For the first time the systems have been extended to outlying offices to bring about a much closer knit operation. In addition, executive and operating personnel have found the combination of an internal telephone system and microwave a means of immediately speeding up contact between various units within a department.

Microwave council meets

The March 20 meeting of the Operational Fixed Microwave Council was characterized by enthusiasm and optimism concerning the future of microwave, despite the fact that an FCC spokesman reported that the pending microwave rules will not likely receive definitive FCC action until a number of more pressing rule-making proceedings received disposition. (Informal indications were that two of the "more pressing" proceedings are the split channel Docket No. 11253 and possibly certain aspects of the overall TV proceeding, Docket 11532.) The FCC spokesman further indicated that when the commission does begin to move on the microwave rules proceeding, it will require certain additional information from users, and some commission policy must be evolved as to whether there actually appears to be a scarcity or plentitude of microwave frequencies for all future applications.

New officers elected for the council were Robert W. Olin, Potlatch Forests Inc., chairman; K. V. Kesley, Fire and Police Signal division of Los Angeles and representative of the International Municipal Signal Association of the OFMC, vice chairman; Robert L. Abel, chief of the American Trucking Association's radio and communications section and also a representative of the OFMC, secretary.

Petroleum industry representatives attending the meeting were Mason Collett, E. H. Wilder, Vinton Long, Clifton Campbell, and Ray Ransome.

E. H. Wilder, chairman of the committee to study the feasibility of establishing a Mobile Users Association, reported that from 14 replies received from mobile user organizations, six were negative to the proposal, while eight responded either favorably to the proposal or qualified a favorable reply by suggesting further study and investigation of the matter. Chairman Wilder indicated that his committee's study will continue.

The Ad Hoc committee of the Radio-Electronics-Television Manufacturers Association presented to the OFMC a brief summary of the status of this committee's study and preparation of documents and information relative to the proposed microwave rules, which were expected to be presented to the commission last month. In part, the report stated: "Eight working sessions of the technical subcommittee have been held during the past seven months, six working sessions of the commercial subcommittee have been held, and five joint meetings of the two subcommittees have been conducted. We are pleased to report that substantial progress has been made toward the objective of summarizing areas of present understanding and establishing new areas of standardization among manufacturers stated above. . . ."

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Aero Exploration Company is proud to have photographed all of the Pacific Northwest proposed route, probably the greatest pipe line project ever conceived. It extends from the San Juan Basin in Northwest New Mexico to the Big Piney Field in Wyoming; on to Portland, Oregon, and Bellingham, Washington, with side lines to Walla Walla, Spokane and Wenatchee.

More recently Aero has completed the photographic survey of the new Texas Eastern Gas Transmission Corporation project, originating at Reynosa, Mexico, to deliver gas to the Baytown facilities. This will make this gas available to the eastern seaboard through Texas Eastern's now existing system.

Here are some of the many firms for whom we have done Photographic Survey Work:

- Atlantic Refining Co.
- British-American Oil Producing Co.
- Cities Service Gas Co.
- Colo. Interstate Gas Co.
- Columbia-Geneva Steel
- El Paso Nat'l. Gas Co.
- Fish Engineering Corp.
- Fish N.W. Constructors, Inc., acting as agent for Pacific N.W. Pipeline Corp.
- Geophoto Services
- Gulf Oil Corp.
- Hancock Oil Co.
- Lakehead Pipe Line Co., Inc.
- Lion Oil Co.
- Magnolia Pipe Line Co.
- Mid-Continent Pipe Line Co.
- Natural Gas Pipeline Co. of America
- Phillips Petroleum Co.
- Seaboard Oil Co.
- Service Pipe Line Co.
- Standard Oil Co. (Ind.)
- Stanolind Oil & Gas Co.
- Sunray Oil Corp.
- Tennessee Gas Trans. Co.
- Texas Eastern Gas Trans. Corp.
- Texas Gas Trans. Co.
- Trunkline Gas Co.
- Williams Brothers Co.

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GAS pipeline people

A. A. WHITE, who has been dean of the University of Houston College of Law since its founding, has joined the Texas Gas Corp., Houston, as general counsel.

DE WITT KNOX has been named vice president and general manager of the J. B. Gill Co., Long Beach, Calif.

General Electric Co. has appointed JOSEPH A. WHITTAKER manager-product service for its medium steam turbine, generator and gear department, Lynn, Mass.

WESLEY EMBRY has been promoted to the position of general manager of Modern Welding Co. Inc., Owensboro, Ky. Mr. Embry, who has been with the company since 1938, has served as welder, pipeline foreman, pipeline superintendent, and general superintendent of the pipeline division.

RAY M. WAINWRIGHT, formerly associate professor in the Department of Electrical Engineering at the University of Illinois, has joined the Electrical-Mechanical division of Good-All Electric Manufacturing Co., Ogallala, Neb., as general manager.

R. M. Wainwright
Good-All

R. T. Buffington
Beaird Co.

R. T. BUFFINGTON, who for the past 12 years has been comptroller of Silas Mason Co., New York, has joined the J. B. Beaird Co. Inc., Shreveport, in a similar position.

C. H. Simon

D. F. Sable
Darling Valve

Several changes have been announced by Darling Valve & Manufacturing Co. CARL H. SIMON has been promoted to vice president and general manager. DICK F. SABLE is now general sales manager, THOMAS C. JESTER is chief engineer, JAMES N. ELWOOD is manager in charge of manufacturing, and PACKER B. YOUNG is assistant sales manager.

Six new vice presidents have been appointed by Motorola Communications & Electronics Inc., Chicago. They include ARTHUR L. REESE, vice president and operations manager and EUGENE S. GOEBEL, vice president for

A. L. Reese

E. S. Goebel
Motorola

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41% LIGHTER!

Made of aluminum, treated with special hardening process. Approximately 41% lighter providing fatigue free durable performance. Designated as Series L, it's available in #3-L, #4-L and #5-L, together with the standard rugged #1-S, #2-S, #3-S, #4-S and #5-S Mathey Pipe Cutting and Beveling Machines. There is no machine lighter than a Mathey Twin. There is no machine more rugged than its brother, the regular standard model. You can't beat a Mathey Machine for accuracy, speed and economy.

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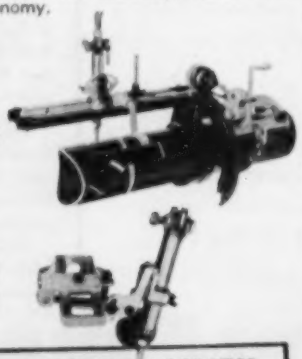

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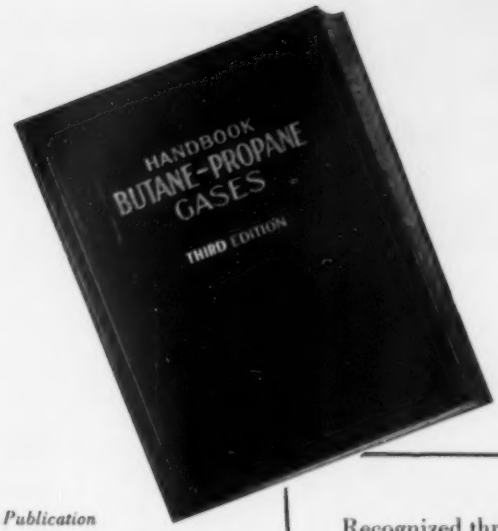

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Model 6QS12
Ledeen **QUAD**
Actuator Mounted
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A unique four-cylinder design provides direct-acting, balanced torque to the valve stem. The use of cylinders offers the basic construction advantages of simplicity and sturdiness, resulting in long and trouble-free life.

QUAD units provide auxiliary manual hydraulic operation. The gas and oil systems in all Ledeen QUADS are completely separate, eliminating any gas-oil interface.

Features

- **Balanced torque delivered to valve stem through four-cylinder construction.**
- **Gas and oil systems are entirely separate. No gas-oil interface.**
- **For periodic testing, detachable lever permits operation of actuator and controls without turning main valve.**
- **Easy field installation without modification of the plug valve.**
- **Available in wide range of torque capacities, and with a variety of control systems.**

Write for Bulletin 3022

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VALVE ACTUATORS
AIR HYDRAULIC
PUMPS & BOOSTERS

Ledeen Mfg. Co.
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pipeline people • *Cont'd.*

market relations. Four former regional managers in the field were appointed vice presidents and placed in charge of new sales divisions. LOWELL E. WHITE heads the eastern sales division, HOMER L. MARRS heads the central division, EDWARD L. FALLS JR. heads the southern division, and DONALD F. BRICKLEY manages the western division.

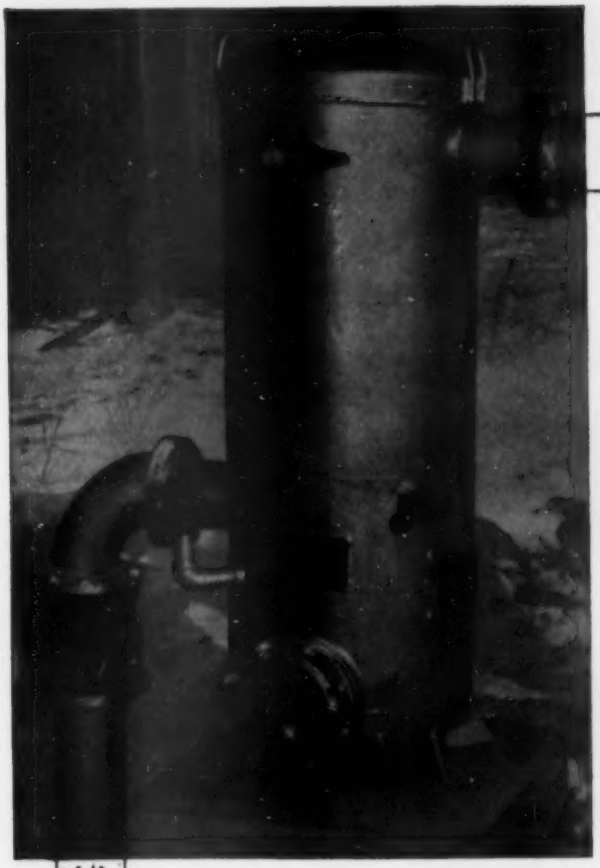
DONALD L. MCCLURE, formerly manager of the L.O.F. Glass Fibers' plant at Parkersburg, W. Va., has been named to the newly created post of director of industrial relations, with headquarters in Toledo. JOHN M. KEENAN, formerly manager of the Waterville plant, succeeds him at Parkersburg, and GERALD L. WHITE, formerly supervisor of the fiber-forming department, succeeds Mr. Keenan.

W. C. Peterson **L. B. Lumpkin**
Bristol Co.

Bristol Co., Waterbury, Conn., has appointed two new district managers. L. B. LUMPKIN will manage the company's Pittsburgh office. He has been manager of the Birmingham office. W. C. PETERSON, who has spent 10 years with Bristol's New York sales force, takes over the managership of the Birmingham operation.

LEONARD ELLER has been appointed assistant superintendent of Lone Star Steel Co.'s electric weld pipe mills. New promotions at Lone Star Steel include CLIFF WRIGHT, head of the utilities department, and FRED FARMER, combustion engineer.

A. WILLIAM FRASER and CLARENCE S. WENTWORTH have been appointed commercial vice presidents of Worthington Corp., Harrison, N. J. Mr. Fraser, with headquarters in Chicago, is in charge of district sales offices in Chicago, Denver, Kansas City, St. Louis, and Minneapolis. Mr. Wentworth headquarters in Cleveland and is in charge of the district sales offices at Buffalo, Cincinnati, Cleveland, Detroit, and Pittsburgh. Worthington has also appointed CHARLES D. CUM-



CLEAN GAS TO USERS →

Blaw-Knox low-height gas cleaners solve a space problem

and they deliver clean gas with no trace of oil carry-over

They provide all the advantages of conventional oil-bath Blaw-Knox Gas Cleaners plus low height for space saving and lower initial cost. Capacity ratings are the same as Blaw-Knox standard Cleaners.

DIRT-LADEN RAW GAS TO CLEANER →

Photograph shows a 24″ diameter Blaw-Knox low-height Gas Cleaner which is only 71″ high over-all. Low height was very desirable in this installation because it saved on construction costs of the building to house the cleaner and the pressure regulators.

Blaw-Knox Gas Cleaners installed at town border and district regulator stations will protect the meters and regulators from dust erosion. By keeping dust from entering the distribution system, they also eliminate complaints due to dirty gas . . . thus insuring good public relations.

Let us submit recommendation of the right type of Blaw-Knox Gas Cleaner for your problem. Tell us the maximum peak hourly load . . . minimum pressure at this peak load . . . and maximum pressure for which the Cleaner should be designed.

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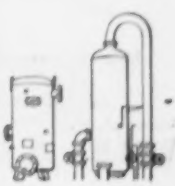
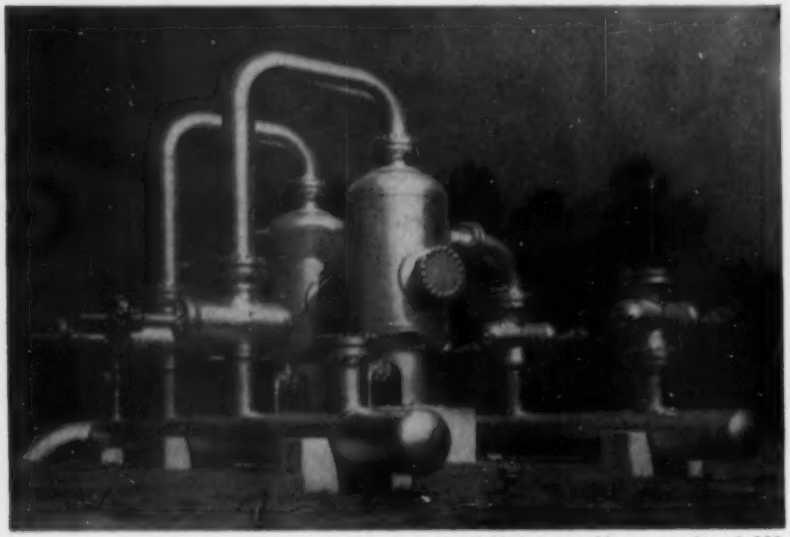


pipeline people • *Cont'd.*

MINS district manager in Seattle. He succeeds E. D. SCHIVELY, who has accepted a special assignment in Worthington's new Canadian operation.

EDWARD J. HART has been appointed manager, RCA microwave equipment sales by the Radio Corp. of America. Also, B. R. DEAN is field sales representative in the southwestern region. L. R. VINCENT, field sales representative in the midwestern and southern regions, temporarily will also represent RCA microwave sales in the eastern region.

FRED E. WILSON, who has been the field superintendent in charge of the Super Inch natural gas line since the first fuel was pumped through it in 1950, will retire from his Pacific Gas & Electric Co. position on July 1. He will be succeeded by RALPH S. NABORS, superintendent of the PG&E northern division. Other promotions resulting are: HARRY PRUDHOMME succeeding Mr. Nabors; ROBERT CALLOW succeeding Mr. Prudhomme as transmission engineer at Rosedale.



Manifolded to provide a capacity of 200 MM SCFD at 650 psig with a pressure drop of 1.5", these Aerotec units remove both dust and liquids from the gas.

AEROTEC GAS SCRUBBERS

designed to remove solids or liquids

On this 845 mile, 30" feeder line from Louisiana to West Virginia, five compressor stations present wide variations in contamination of gas being transported.

At some stations, the scrubbing problem presented is one of dry dust removal. All others, fluid carryover requires the removal of dust and liquid. Aerotec Scrubbers for these compressor stations were designed to handle the conditions encountered at each station. Resulting gas delivered to the 8000 horsepower compressors is dry and free from abrasive dusts.

Aerotec Gas Scrubbers are noted for their ability to deliver gas, free of fluid carryover. No liquids used in the scrubbing process makes this possible. Temporary overloads of up to 100% are easily handled without efficiency loss.

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GAS progress reports

NEW CONSTRUCTION PLANNED

COLORADO INTERSTATE GAS CO., Colorado Springs. 1957 program: 16-mile, 26-in. line, Carr to Idalia, Colo.; 75-mile, 26-in., Kit Carson to Idalia; 307-mile, 30-in., Idalia to Beatrice, Neb.; 109-mile, 20-in. in Texas and Oklahoma Panhandles; 106-mile, 24-in., Springfield to Kit Carson, Colo.; and seven new compressor stations totaling 23,000 hp.

GULF INTERSTATE GAS CO., Houston. Docket G-9900 to add 8000 hp in compressor capacity at four existing stations.

MICHIGAN WISCONSIN PIPE LINE CO., Detroit. Docket G-9850 for 424 miles of extensions, 48 miles of mainline loop, and a total of 12,600 hp in compressor capacity in Wisconsin, Illinois, and Michigan, to initiate gas service to 10 companies for distribution in 41 communities in Wisconsin and one in Michigan.

NORTHERN NATURAL GAS CO., Omaha. With subsidiaries, would build 73 miles of 20-in. line from Savanna Creek area to Pincher Creek area and from there 32 miles of 24-in. to the international boundary to export 300 MMcf/d from Alberta. At international border, subsidiary would construct a 26-in., 1100-mile line to connect with Northern's system near Minneapolis.

PENNSYLVANIA GAS CO., Warrensburg, Pa. Docket G-10098 for 23 miles of 10-in. line in Erie county, Pa. and 15 miles of 8-in. in Warren and Chautauqua counties to make gas service available to communities from Union City to Fairview, Pa.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. To lay 40 miles of line in Jefferson Davis and Acadia parishes, La.; Chicot, Ark.; Washington and Coahoma counties, Miss.; Daviess county, Ky., and Crawford county, Ill. Add 12,320 hp at six compressor station: Pineville, La., two 1500-hp engines; Bastrop, La., one 2000 hp; Columbia, La., two 1500 hp; Covington, Tenn., one 1500 hp; Dillsboro, Ind., one 1320 hp; and Jeffersontown, Ky., one 1500 hp.

CURRENT CONSTRUCTION

AMERICAN LOUISIANA PIPE LINE CO., Detroit. Docket G-2306 to construct 1289 miles of line—30-in. from North Tepetate, Acadia parish, La., to connect with Michigan Consolidated facilities near Detroit; 24-in. to feed into 30-in. line in Louisiana; also three 10,000-hp compressor stations. Included but not approved is the 117-mile, 22-in. line to extend from Payne, Ohio, to Bridgman, Mich., to connect with Michigan Wisconsin Pipe Line Co. Brown & Root has laid 73 miles, Houston Contracting 142 miles, H. C. Price 156 miles. All major river crossings are complete. Completion is scheduled for June 1956 and project is on schedule.

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 134 miles of 6⅝- to 24-in. line in 11 sections, and 10,500-hp compressor station on its system in Arkansas, Louisiana, and Texas. Compressor station and 71 miles of line completed.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2121 - (1956 program) 239 miles of 22-in. line from Laramie, Wyo. to connection with Pacific Northwest Pipeline Corp. line at Green River, Wyo.; with 4400-hp compressor station near Green River. R. H. Fulton will start two spreads April 15. Completed by Nov. 1.

PACIFIC NORTHWEST PIPELINE CORP., Houston. Dockets G-1429 and 8932 et al for 1487 miles mainline; 443 miles of spur and lateral lines; and 13 mainline compressor stations totaling 83,500 hp and 2 booster stations totaling 4620 hp, to extend from Ignacio, Colo., in the San Juan basin, to Sumas, Wash. (Canadian

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THIS coal tar-protected pipeline was buried 23 years in soil permeated with salt water and industrial refuse. But when it was unearthed for inspection, the coating showed no signs of deterioration or failure of any kind!

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When you buy *Pitt Chem,* you buy assured pipeline protection with every drum, because *Pitt Chem* Coal Tar Coatings are manufactured to published specifications. ● Call on a *Pitt Chem* man to help you plan your next pipeline protection job. He's fully equipped to give you valuable technical assistance . . . and to guide you to long-run protection economies.

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progress reports • *Cont'd.*

border). Fish Northwest Constructors Inc., builders of the line, have let contracts to River Construction Corp., R. H. Fulton & Co., Associated Pipeline Contractors, A. J. Curtis Construction Co., B. & M. Construction Co., Midwestern Constructors Inc., H. B. Zachry Co., and Fulghum Construction Co. for first 1061 miles. Completion scheduled for fall of '56. As of Jan. 1, about 691 miles of mainline and 163 miles of gathering and lateral lines had been lowered in.

TEXAS EASTERN TRANSMISSION CORP., Shreveport. Docket G-2503. Three compressor stations remain to be completed.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. Docket G-8828 for 189 miles of line and 19,190 hp in compressor capacity along its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana. Contracts for 10,820 compressor hp let to Longview Equipment Co. and 6000 hp to Ford, Bacon & Davis. Compressor construction begun.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-2534, *et al*, to build approximately 220 miles of 26- and 30-in. mainline loops paralleling its system in Kentucky and Ohio; installation of 12,540 hp additions; and 376 miles of line required to connect its new gas supplies, 355 of which will comprise an extension of its system into southeastern Louisiana. About 22% of pipe lowered in on Louisiana portion.

TRUNKLINE GAS CO., Houston. Dockets G-8664 and G-8665 for eight new compressor stations in Texas, Louisiana, Mississippi, Tennessee, and Illinois totaling 56,000 hp; and 24 miles of line paralleling existing system in Texas. Line completed; stations nearing completion.

UNITED GAS PIPE LINE CO., Shreveport. Docket G-8230 for 62 miles of line in Mississippi, Alabama, and Florida. Additions to compressor stations 95% completed by Joe R. Turner.

WESTCOAST TRANSMISSION CO. LTD., Calgary. To build 650-mile, 30-in. line from Peace river area to near Vancouver, B. C., to connect with line of Pacific Northwest Pipeline Corp., to transport 370 MMcf daily, of which 300 MMcf is to be delivered to PNW. Work has commenced on all four sections between Peace river and International Border. Scheduled for completion in 1957.

APPROVED

ATLANTIC SEABOARD CORP., Charleston, W. Va. Docket G-9758 for 86 miles of line in West Virginia and Virginia. 31 miles would parallel part of existing 26-in. line and 55 miles would extend from Lost River compressor station in Hardy county, W. Va., to Bickers station in Greene county, Va., interconnecting 26- and 20-in. lines.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-9860 for 27-mile extension of existing line to extend line from Elk county, Pa. to new Luthersburg gas field in Clearfield, Jefferson, and Indiana counties, Pa.

PERMIAN BASIN PIPELINE CO., Omaha. Docket G-9688 and 9724. For 19-mile, 16-in. line and 6750-hp compressor station in Andrews county, Texas, to take gas from Phillips gasoline plant.

Design Factors in Telemetering Systems

Four important points to consider in planning for remote measurement or recording

A BRISTOL APPLICATION NOTE

Telemetering systems provide a proven way to keep tabs on a remotely located process, pipe line, service or utility. In fact, any time remote indication recording, or control is required, telemetering can serve your needs.

Here are the four conditions which must be considered in selecting the best telemetering system for any installation.

1. VARIABLES

Most industrial variables can now be measured, computed, and converted into a form that can be transmitted electrically. Their number and variety influence circuit complexity and the appearance of the receiving panel. Some variables now being successfully telemetered include:

Pressure • Current and voltage • Temperature • Flow • Electrical power • Wind velocity • Liquid level • Motion • BTU's • pH Horsepower • Speed

2. FREQUENCY OF READING

While the majority of telemeter systems in service today are the point-to-point continuous recording type, complex networks and interrelated variables are making sophisticated approaches more and more necessary. The problem usually boils down to these questions: how often is measurement necessary, and what is the least costly way to install and run the system?

Five types of possible hook-ups are:

Continuous recording—where variables are critical and need constant watch.

Intermittent indicating—where variables need only be checked at intervals.

Continuous-Intermittent—where it is possible to separate more critical variables for constant and intermittent telemetering.

Grouped-Multiplex—where several measurements can be transmitted as a group over a single circuit into a "multiplexed" receiver.

Successive-Multiplex—where measuring points over a large area can be "multiplexed" at intermediate locations, then herded to the panel.

3. TERRAIN

The type of interconnecting circuit between the measuring transmitters and central panel usually depends on the terrain: its topography, weather, and degree of settlement. Hence, signals may be carried by one, or by combinations, of the basic transmission media:

Radio—various types of radio can be used to take signals over mountains, deserts, and seas.

Wire—strung wire or leased lines can cover plant, urban, and rural areas.

4. INSTRUMENTATION

Bristol Metameter® Telemeters are eminently adapted to any of the conditions of measurement frequency, variables, or terrain likely to be encountered in telemetering. Transmission can be provided over telephone circuits, carrier current, radio—including microwave, VHF and UHF—and private wires, multiplexing and selective calling. Under all sorts of conditions, thousands of installations, ranging from just a few to hundreds of instruments each, have proven the dependability and reliability of Bristol Telemeters—pulse width (or duration), differential transformer, and voltage types, as well as pneumatic systems.

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GAS pipeline news

Colorado Interstate plans 350 MMcf/day increase in system capacity

COLORADO INTERSTATE GAS CO. has requested FPC approval for a $76 million expansion program which will increase its daily delivery capacity of natural gas by 350 MMcf.

The program calls for construction of new pipeline facilities by Colorado Interstate to deliver natural gas to Natural Gas Pipeline Co. of America, a subsidiary of People's Gas Light & Coke Co., Chicago, at Beatrice, Neb. Natural Gas Pipeline in turn will transmit the gas to customers in Illinois, Indiana and Iowa. Natural Gas Pipeline now has a request before the FPC for authority to expand its facilities to handle the gas it will purchase from CIG. Colorado Interstate now is selling to Natural Gas Pipeline at Hooker, Okla, and in Texas.

Construction is expected to start in early 1957, with completion scheduled by the end of the year.

President W. E. Mueller said Colorado Interstate's project, largest in the company's 29-year history, includes nearly 800 miles of mainlines and six new compressor stations with a total of 35,500 hp. Four other compressor stations will be increased a total of 17,800 hp.

Included in the new facilities are 307 miles of 30-in. transmission line from Idalia, in northeastern Colorado, to Beatrice. Gas supplies will be fed into this trunk line from western and southern sources through two new 26-in. lines.

One of these 26-in. lines will run 160 miles from a point near Carr, Colo., to Idalia. This line will be a take-off from CIG's Green River (Wyo.)-Denver line. The Denver-Laramie (Wyo.) section of this line is completed, while the remainder is slated for completion this year.

The other 26-in. line will be 75 miles long, from the company's present compressor station near Kit Carson, Colo., to Idalia.

CIG also plans construction of a 215-mile line to bring gas from its supplies in the Texas and Oklahoma Panhandle fields to the Kit Carson station. This line, made up of 20- and 24-in. pipe, will parallel the present transmission line between the two locations.

Construction of 34 miles of 16-in. lines is proposed to move additional supplies of gas from the Keyes field of Oklahoma and the Greenwood field of Kansas into the new north-south transmission line.

Approximately 185 MMcf/d will be moved from CIG's southern supply sources into transmission facilities for delivery at Beatrice to Natural Gas Pipeline.

Transmission facilities from western sources will have a capacity of 265 MMcf/d, including 165 MMcf for delivery at Beatrice. The remaining 100 MMcf will be delivered into the Denver market area.

Colorado Interstate will purchase most of this gas from Pacific Northwest Pipeline Corp. and Intermountain Gas Co. Some supplies also will be obtained from the Table Rock field adjacent to CIG's pipeline in the Green River basin.

Proposed new compressor stations

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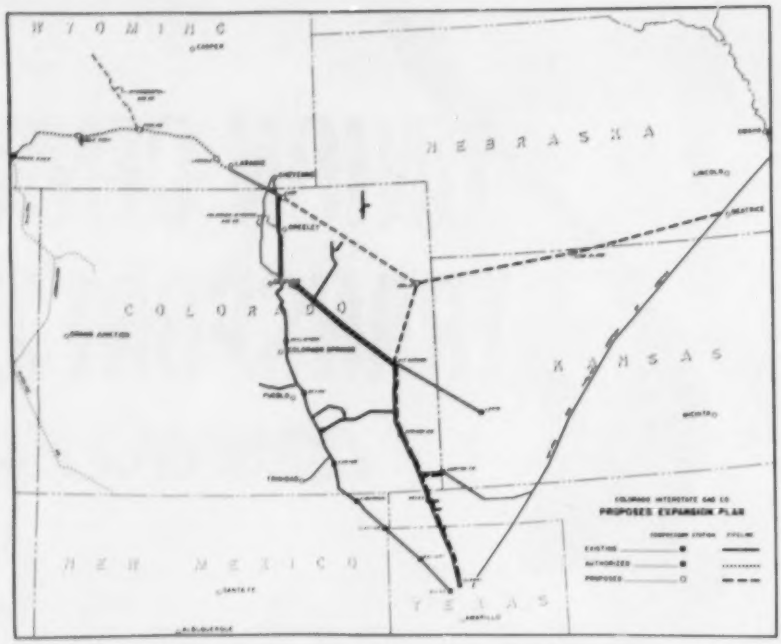

Broken line from Carr, Colo. to Idalia and Kit Carson, Colo. and from Idalia to Beatrice, Neb. is route of Interstate's expansion.

will be located near Table Rock, Rawlins, and Laramie in Wyoming, at the Colorado-Wyoming border near Carr, at Idalia, and at Long Island, Kan. Additional horsepower will be installed at Fourway and Bivins stations in Texas, and at Lakin and Morton county stations in Kansas.

Completion of the proposed facilities will expand Colorado Interstate's pipeline system to more than 3700 miles of transmission, sales, and gathering lines. Annual gas sales will increase about 110 billion cu ft, almost 50% of sales in 1955.

Panhandle plans appeal in Canadian export plan

Panhandle Eastern Pipe Line Co.'s request to export up to 15.5 billion cu ft of gas per year to Union Gas Co. of Canada has been turned down by an FPC presiding examiner, who, at the same time, approved pipeline facilities estimated to cost $39.9 million (Dockets G-1705, et al). Panhandle indicates it will appeal the decision.

Presiding Examiner Howell Purdue said that the proposed export would impair the ability of Panhandle and Trunkline Gas Co., Houston, to render adequate service to their customers in the U. S. Trunkline supplies part of Panhandle's natural gas requirements.

Most of the facilities authorized have already been constructed by Panhandle and are in operation under temporary certificates issued by the FPC (see November 1955 GAS, p. 136). Trunkline also received a permanent certificate for its $17.6 million plan to increase its system capacity by 85 MMcf/d.

Michigan Wisconsin to supply 10 companies

New pipeline facilities to bring natural gas service to 10 companies for distribution in 41 communities in Wisconsin and one in Michigan are planned by Michigan Wisconsin Pipe Line Co., Detroit (Docket G-9850).

The proposed project, which will cost approximately $17.6 million, would include 424 miles of pipeline extensions, 48 miles of mainline loops, and a total of 12,600 hp in compressor capacity in Wisconsin, Illinois, and Michigan. Requirements of the new customers would total 74,391,000 cu ft of gas per day in the third year.

Underground storage planned by PG & E

Pacific Gas & Electric Co., San Francisco, plans to convert the Pleasant Creek field in Yolo county, Calif. into its first underground storage area. The field, which had an estimated original reserve of 5.6 billion cu ft and is now down to 2.4 billion, is nearing the point of diminishing returns.

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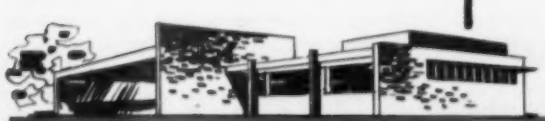

Above . . . another snapshot for the Midwestern album of successful pipelines. Two products on this one . . . ASBESTOS FELT from Keystone Roofing Manufacturing Co. and COROMAT underground glass pipe wrap from Owens-Corning.

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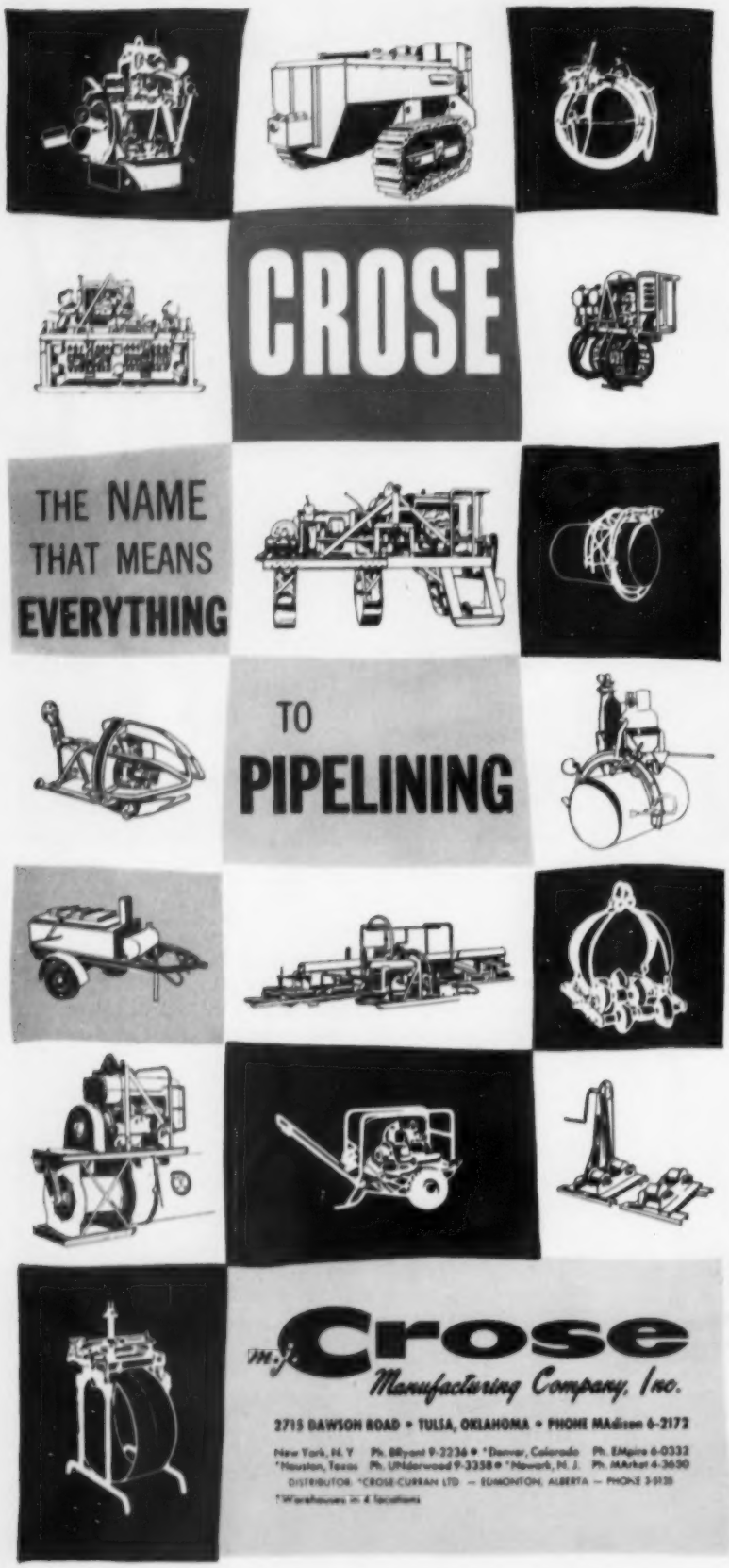
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ous interests since the field was discovered in 1948, three became productive. The three productive wells will remain in operation and, according to Norman R. Sutherland, PG&E president and general manager, the company will drill six more.

Plans also call for construction of a 2640-hp compressor station and laying pipe in a gathering system which will connect each well to the compressor. The plant will be capable of injecting gas obtained from its general system at a rate of about 36 MMcf/day. It is expected that the project will be capable of delivering gas from storage into the system at a maximum rate of 80 MMcf/day. A 16-in. main will connect the field with PG&E's main transmission system in the vicinity of Dixon.

The entire project, including rights on about 2200 acres, is estimated to cost about $3.3 million. In the first step toward the development of the project, the company has concluded agreements for acquisition of all interests in the underground zone which were held by Shell Oil Co. and Mohawk Petroleum Corp., and PG&E representatives are currently negotiating with landowners for the additional interests required.

The underground storage zone in the porous sand formation is sealed by a thick layer of shale on the top and by water on the lower side. Pressure in the field will be raised no higher than that which existed when the field was discovered—about 1250 psi.

"Average day" rate base demanded by FPC

Ohio Fuel Gas Co.'s contract demand form of rate have been disallowed by an FPC presiding examiner, who has directed the Columbus, Ohio company to file within 45 days a two-part rate computed on an "average day" basis.

In the average-day rate form, the demand charge is based on actual use during the past 12 months, while in the contract demand form the billing demand is at least 90% of a predetermined amount of available capacity as requested by the customer.

The proceeding in which the ruling was made involves a proposed rate increase by Ohio Fuel which was suspended by the FPC in October 1953 but has been in effect, subject to refund, since March 1, 1954. Ohio Fuel was proposing to increase its rates by approximately $1,049,000 per year. However, at the time it made this filing it had pending before the FPC two

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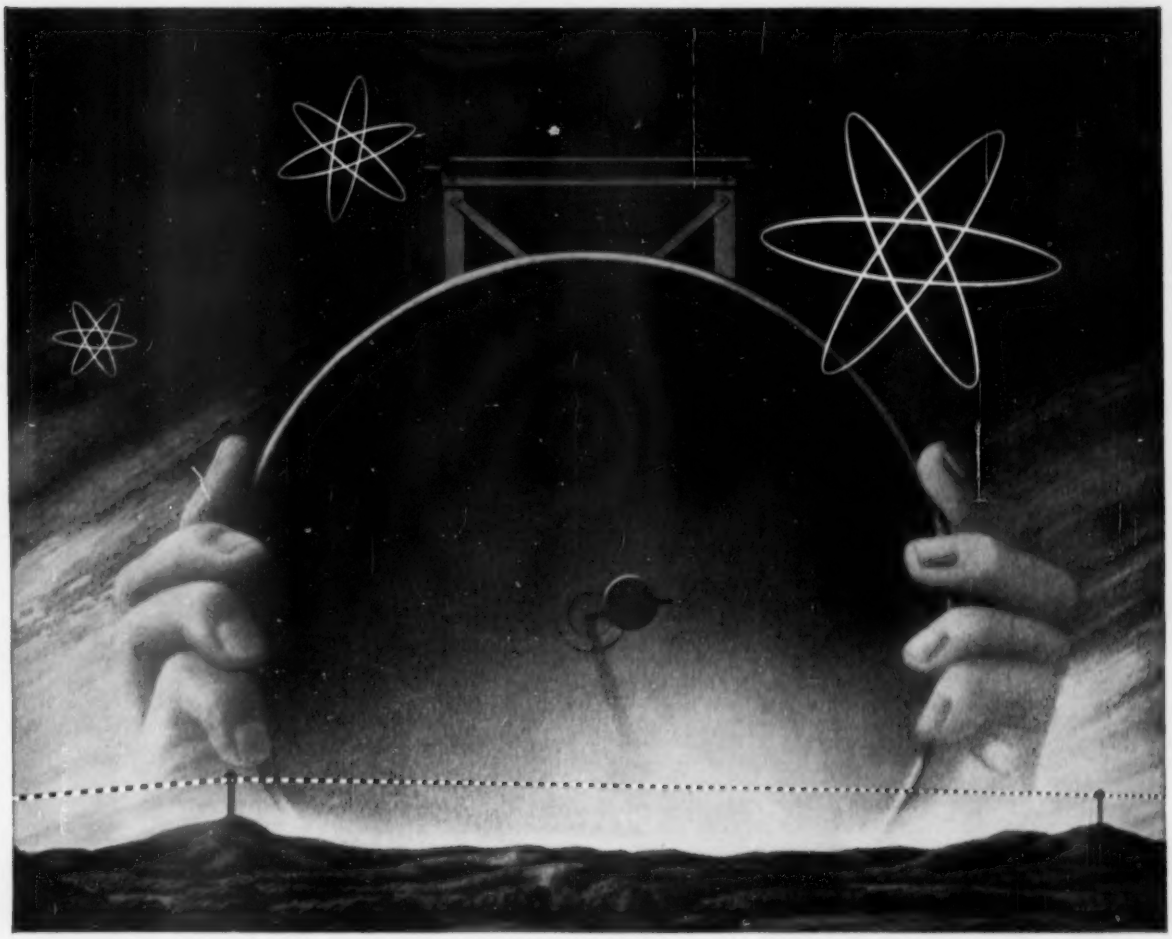

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earlier rate increase proposals which subsequently were disallowed in part by the commission. The rates approved by the presiding examiner will produce approximately the same level of revenues as those approved by the commission in the two earlier cases. Thus Ohio Fuel would be required to refund to its 25 wholesale customers in Ohio the difference between the rates allowed by the examiner and those which it has been collecting since March 1, 1954.

Presiding Examiner William J. Costello said that the "major contest" in this proceeding arises from the contract demand form of rate which Ohio Fuel had proposed. (Under a two-part rate the total cost of service is recovered through the demand and commodity components. Through the commodity charge, the customer pays a fixed amount per unit of gas delivered. The demand charge provides for payment to compensate the supplier for reservation and use of capacity.)

The decision points out that the contract demand rate form sought by Ohio Fuel in this proceeding is substantially the same as the form of rate sought in the two previous filings which the commission denied. The presiding examiner said that he could not discover any changed conditions, changed circumstances or new facts of a material nature which would warrant a different conclusion from that reached by the commission previously.

Ohio Fuel contended that the contract demand form of rate was necessary to protect it when anticipated requirements of its customers fail to materialize after it has incurred costs to provide them with a supply of gas. The company's rate filing was opposed chiefly by three of its customers—Dayton Power & Light Co., Cincinnati Gas & Electric Co., and the City of Lancaster.

The examiner actually fixed three different rates for Ohio Fuel, one covering the period during 1954 for which costs are known, and the others for the present and future periods subsequent to 1954 for which costs must be developed.

Commission denies plan to supply power station

Declaring that the sale would aggravate the gas supply problem, the FPC has denied a proposal by Northern Natural Gas Co. to build pipeline facilities to supply gas on an interruptible basis to the Black Dog power generating station near Minneapolis of Northern States Power Co. (Docket G-2409).

In affirming an examiner's earlier decision, FPC said that the gas supply problem " . . . increasingly perplexes Northern and most other . . . pipeline companies . . . in these days of diminishing reserves and increasing demand." It also said the record lacks the evidence necessary to evaluate the future effects on Northern in creating a need for additional reserves and that "a persuasive showing has been made of the adverse impact of the sale on economic conditions in areas supplying coal for the Black Dog plant."

Commissioners Seaborn L. Digby and Frederick Stueck took issue with the commission's action, declaring that it was not based strictly and solely on the record developed in the proceedings. They said they are convinced that Congress gave the FPC no authority to make a national policy on natural gas conservation, a power which, they said, rests with the states where this resource is found.

The two commissioners said that while they are very much concerned with the conservation of our natural resources and the prevention of waste, out of respect for the Natural Gas Act "we must confine ourselves within the

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limitations of our legally delegated powers and privileges." They also declared that an FPC conservation policy could run into a direct conflict with state conservation authority in those cases where casinghead gas is denied to industrial markets and would have to be flared in the fields. Such flaring, they indicated, is generally prohibited by state conservation laws.

Continuing, they said that they are opposed to the commission's setting up an over-all standard for the end-use of natural gas. They declared that this question must be considered and determined upon the facts surrounding each individual transaction, with consideration being given to gas supply, conflicting demands for gas, and the public interest served by its use.

Commissioner William R. Connole indicated that he agreed completely with the majority report, but was filing his separate concurring statement because he had "additional and more universally applicable" reasons and desired to explain the basis for his "convictions with respect to the boiler fuel problem in fuel-competitive areas and the doubtful wisdom of depending on boiler fuel sales in such areas in attempting to make low-load factor, high-volume sales more profitable."

While in some cases the use of natural gas as boiler fuel may result in lower prices for electricity and at the same time, through load factor improvement, may act indirectly to reduce the cost of providing gas for space heating and other low load-factor uses, Commissioner Connole said, no such immediate advantages are foreseeable from this proposed sale.

He pointed out the sale would be made in an area where alternative fuels' prices were within or were approaching a competitive level with natural gas. He said that in such areas, "load factor built on relative expensiveness of coal and fuel oil may be a worse than doubtful economy." In such fuel-competitive areas, he said, there should be a "legitimate and demonstrable" margin between incremental out-of-pocket pipeline costs of a sale and the cost of energy from other sources. This margin should be of adequate dimension for current purposes and should continue "for a considerable future period" to justify "longer term requirements," the commissioner said.

He declared further that "any sale of natural gas at below cost is of transitory benefit regardless of load factor effects." He said that Northern's application fails to show that the proposed sale would be made at a rate which would recover costs. It is readily apparent, he stated, that the proposed sale, if financially feasible at all, will support itself at an average price of 23.5 cents per thousand cubic feet only temporarily. Citing these and other factors which he termed deficient in Northern's proposal, Commissioner

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A group of T. D. Williamson representatives inspect the latest model of WmSon-Hillco tapping machines while attending a refresher course held at the Tulsa offices. Standing (from left): Tod Pazdral, Jim Ford, and Dick McHenry, all of Tod Pazdral Pipeline Specialties; Don Corp, factory engineer; Ken Cusick, James S. Kane & Co.; Fred Crandell, research engineer; and T. D. Williamson, president. Kneeling: Jack Stout, Canadian Equipment Sales; Jack Duke and Jack Pekley, both of Topaz.

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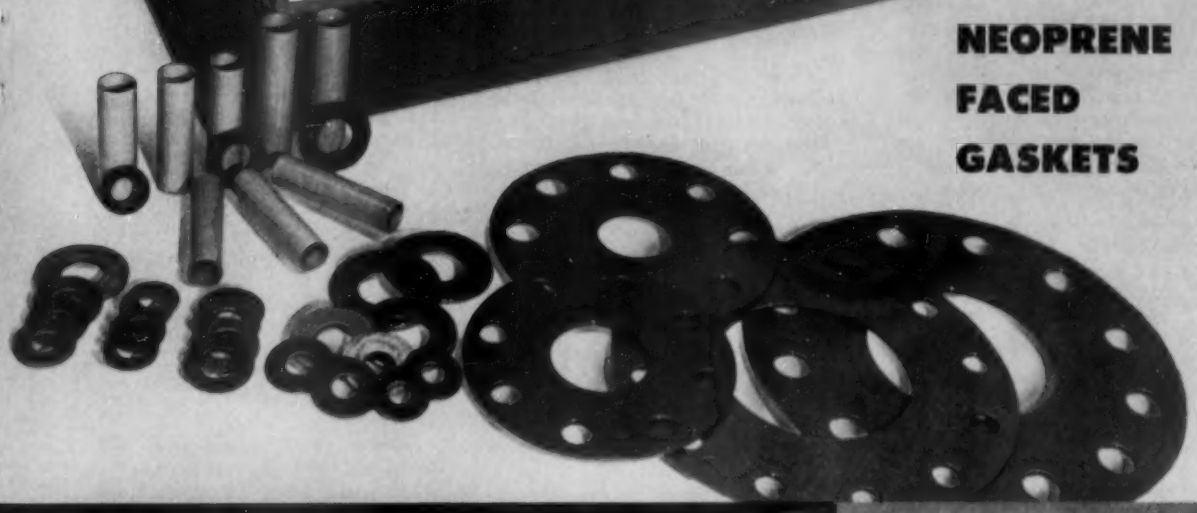

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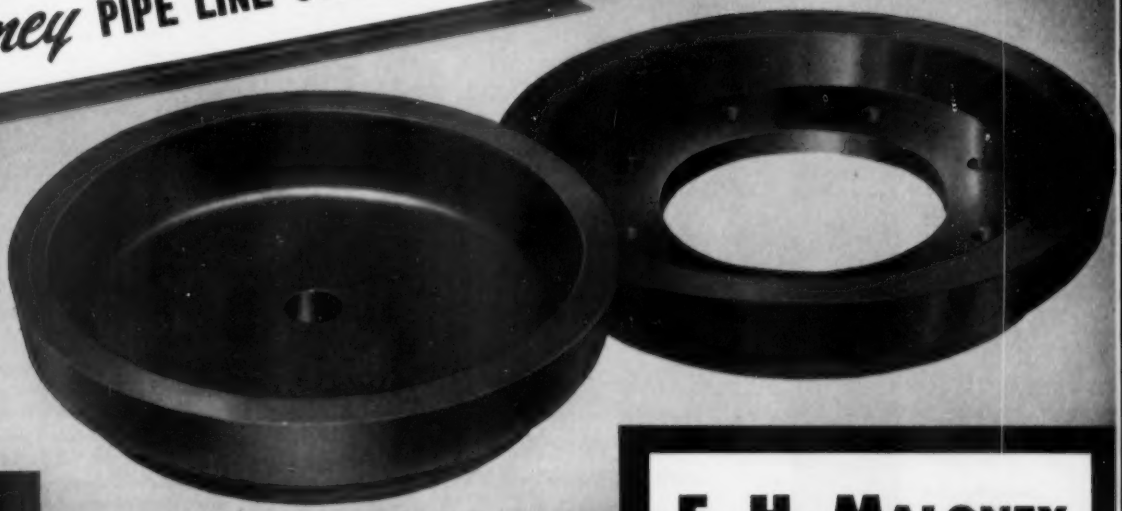

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pipeline news • *Cont'd.*

Connole said he was led "inevitably to the conclusion that the proposed construction and operations are not required by the public convenience and necessity."

Concluding, he asserted that the problems faced by Northern and other pipelines in "fuel-competitive areas distant from producing areas will be aggravated, not solved, by dependence on the illusory benefits of uneconomic sales such as the one proposed." He said it is the responsibility of the FPC to prevent the waste of natural gas in pursuit "of this economic will-of-the-wisp," and a responsibility "shared by pipeline, distributing company, consumer and commission to seek the soundest solution to these problems."

TGT anticipates increased requirements

Texas Gas Transmission Corp., Owensboro, Ky., is seeking authority to construct $6.2 million in additional facilities this year to meet revised estimates of customers' requirements for the 1957-58 heating season. Already under way this year is a $20 million expansion program based on previous estimates.

Included in the most recent application are additions of 12,320 hp at six compressor stations and approximately 40 miles of paralleling lines.

Compressor capacity would be added at company stations as follows: Pineville, La., two 1500-hp engines; Bastrop, La., one 2000-hp engine; Columbia, La., two 1500 hp; Covington, Tenn., one 1500 hp; Dillsboro, Ind., one 1320 hp; and Jeffersontown, Ky., one 1500 hp.

Pipe will be laid in Jefferson Davis and Acadia parishes in Louisiana; Chicot, Ark.; Washington and Coahoma counties in Mississippi; Daviess county, Ky.; and Crawford county, Ill.

Export of Canadian gas sought by Northern

Northern Natural Gas Co. has asked the Alberta Petroleum and Natural Gas Conservation Board for permission to export 300 MMcf of surplus gas per day from Alberta to the United States.

The gas would be transported by the Omaha company to its markets in the Northern Plains and to other pipeline companies serving the Great Lakes area of the U. S. Northern's application states that the surplus gas would come from Northern's wholly owned subsidiary, Northern Natural Gas Producing Co., and other producers in Alberta.

The producing subsidiary holds a joint interest in natural gas rights in the Savanna Creek area where there have been recent significant gas discoveries. The company expects to receive approximately 100 MMcf/day from the area by 1957. It also expects to purchase 200 MMcf/day of surplus gas in southern and central Alberta.

Under the plan, Northern, through a subsidiary or nominee, would construct a main gathering pipeline 100 miles southeast from the Savanna Creek gas field to the Alberta-Montana border south of Cardston, Alta. The pipeline, estimated to cost $8 million, would include 73 miles of 20-in. pipe from the Savanna Creek area to the Pincher Creek area and from there 32 miles of 24-in. line to the International Boundary. The application states that present gas reserve estimates in the Pincher Creek field indicate that substantial volumes of surplus gas may be available in excess of the volumes heretofore made available to Trans-Canada Pipe Lines Ltd.

At the border, Northern Natural would sell the gas to a wholly owned subsidiary, Northern Plains Natural

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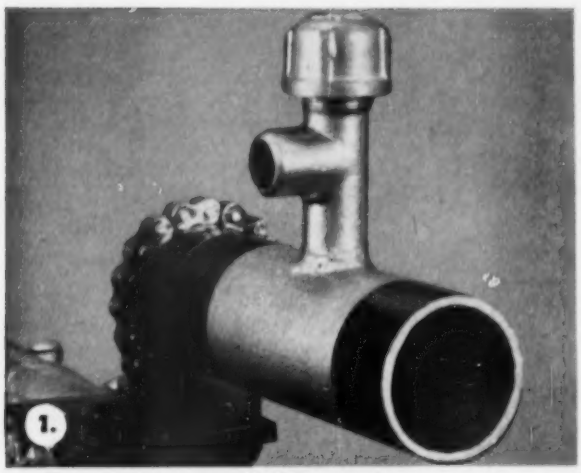

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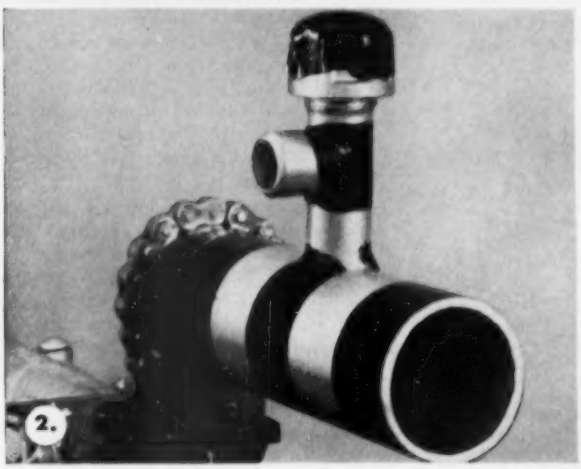

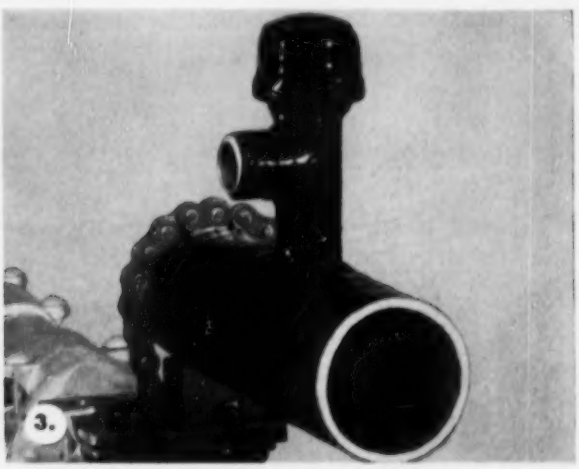

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Complete catalog, Sweet's Industrial Construction File, Sec. 6c Ke

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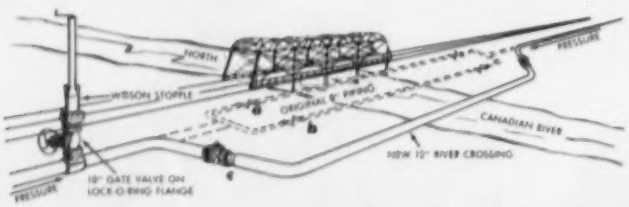
① TWO 10" FLANGED SPLIT-TEES WERE WELDED TO THE LINE ON EITHER SIDE OF THE RIVER



② TAP WAS MADE WITH WmSON-HILLCO MODEL 660 TAPPING MACHINE

③ WmSON STOPPLE REPLACED TAPPING MACHINE ON CLOSED VALVE

④ LINE WAS PLUGGED ISOLATING SECTION BETWEEN STOPPLE AND VALVES a. & b. (CITY LOOP SYSTEM MAINTAINED SERVICE TO RIVER FROM EACH SIDE.)

⑤ ISOLATED SECTION WAS THEN CUT AND NEW 12" CROSSING TIED INTO 10" LINE

⑥ FOR REMOVAL OF VALVE, LOCK-O-RING PLUG WAS INSTALLED IN L-O-R FLANGE WITH TAPPING MACHINE

⑦ TAPPING MACHINE AND GATE VALVE WERE REMOVED AND BLIND FLANGE INSTALLED

THIS ENTIRE OPERATION WAS THEN REPEATED ON THE OPPOSITE SIDE OF THE RIVER

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pipeline news • *Cont'd.*

Gas Co. This subsidiary would construct a 26-in. line approximately 1100 miles to connect with Northern's present system near Minneapolis. The line would extend through northern Montana and northern North Dakota to Grand Forks where it would turn southeast to Minneapolis.

Northern asked that the permit cover 25 years from the fall of 1957. The maximum daily volume proposed at this time would be 300 MMcf/d. The application states that at an annual load factor of 90%, the annual withdrawals would approximate 90 billion cu ft. Gas reserves for the 25 years on this basis would be 2.5 trillion cu ft.

Hearings to determine Union Producing status

Hearings will get under way May 21 in Washington to determine whether Union Producing Co., Shreveport, is subject to regulation under the Natural Gas Act.

In November 1954, Union Producing filed a complaint in the U. S. district court for the District of Columbia for an order enjoining the Federal Power Commission from directly or indirectly attempting to enforce its Orders No. 174 and 174-A. The court issued an order which temporarily restrained the commission from taking any action directly or indirectly against Union Producing.

The court stated, however, that the order shall not restrain the FPC from making an administrative finding and determination in a hearing properly instituted as to whether the company is a natural gas company within the meaning of the Natural Gas Act.

FPC workload reaches "record proportions"

Thousands of filings by independent producers of natural gas pushed the Federal Power Commission's workload to "record proportions" during the fiscal year ended June 30, 1955, the agency reports in its 35th annual report to Congress.

The commission said that the impact of the U. S. Supreme Court's June 1954 decision in the Phillips case was felt at all levels of operation during the 1955 fiscal period. As a result, the FPC declared, regulation of the producers tended to overshadow all other activities even though operations in regulating other segments of the utility industries remained at or near the peak levels reached in previous years.

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Today you can protect joints and fittings on steel gas pipe lines with just one low-cost wrap. L·O·F Glass Fibers' Duratape is glass-mat-reinforced, combines high dielectric strength with excellent resistance to causes of corrosion.

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pipeline news • *Cont'd.*

By June 30, 1955, the commission had received a total of 10,978 rate filings and 6047 certificate applications, according to the report.

The continued tremendous growth of the nation's electric utility and natural gas industries also increased the scope of its duties and responsibilities in administering the Federal Power and Natural Gas Acts. At the same time, the report indicates, regulation of the rates of natural-gas companies was one of the commission's major problems during the year, with the situation "aggravated" by the rate increase applications of the independent producers. The FPC said that for the past several years it has been carrying forward a backlog of natural gas rate increase proceedings, and as a result of the independent producer filings it "lost ground" during the 1955 fiscal period.

The continuing growth of the natural gas industry was reflected in the FPC's activities in issuing certificates authorizing new pipeline facilities, as well as in the agency's rate regulatory work. During the fiscal period the commission disposed of 159 applications for certificates by interstate pipeline companies, involving a total of 5095 miles of pipeline, 259,039 compressor horsepower, and costing $470,176,588. At the end of the year there were still pending 117 applications for a total of 6016 miles of pipeline, 365,030 hp in compressor capacity, and involving facilities estimated to cost $585,343,338.

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Carolina Pipeline gets PSC bid to serve 26 towns

Carolina Pipeline Co., Charleston, S. C., has won PSC approval of its bid to furnish natural gas to 26 northern and eastern communities in the state (see GAS, April, p 168). Turned down was the petition of Carolina Gas Corp., Florence, to serve the same area.

Carolina Pipeline will spend $8 million to bring gas to Camden, Sumter, Florence, Darlington, Dillon, Marion, Mullins, Latta, Chester, Lancaster, Rock Hill, Bethune, Bishopville, Hartsville, Cheraw, Bennettsville, McColl, Van Wyck, Society Hill, Pontiac, Kershaw, Great Falls, Winnsboro, Fort Mill, York, and Clover. The company will buy its gas from Transcontinental Gas Pipe Line Corp.

Pacific's capitalization reaches $217 million

Pacific Northwest Pipeline Corp.'s new plan for financing the construction of facilities for the importation and sale of natural gas from Canada involves more than $50 million, which brings the total capitalization of the company to approximately $217 million.

C. R. Williams, president of Pacific Northwest, said that the proceeds of this new financing will be used for the installation of large diameter pipe at the northern end of its pipeline system, extension of its line to the proposed point of interconnection at the international boundary, construction of additional sales laterals and installation of additional compressor facilities.

Pacific Northwest Pipeline also proposes to acquire 25% of the common stock of Westcoast Transmisson Co. Ltd. to be outstanding upon completion of the latter company's forthcoming financing program.

The company also announced plans to expand the operations of its production subsidiary. This plan provides for the sale of one share of Northwest Production Co. stock for each share of Pacific Northwest Pipeline presently outstanding to Pacific stockholders of record. This sale will increase the production company's available cash to over $3 million. The plan further provides

that Northwest Production will acquire approximately 83,000 acres of leases in the San Juan basin. The company plans to expand the scope of its activities generally and to develop the acreage in the San Juan basin.

NY State Natural tying into new field

A 27-mile extension of a New York State Natural Gas Corp. line to connect with a new natural gas field in Pennsylvania has been approved by the FPC (Docket G-9860).

The new line, estimated to cost $1.5 million, will extend an existing line from a point in Elk county, Pa., to the new Luthersburg gas field in Clearfield, Jefferson and Indiana counties.

FPC okays changes in Pacific's plans

Pacific Northwest Pipeline Corp. has been authorized to construct lateral pipelines in Washington with diameters larger than those originally authorized and build about 50 miles of new line in Colorado to serve two direct industrial customers (Dockets G-9977, 9979, and 10008).

The Walla Walla lateral will be 31 miles of 6-in. instead of the 29 miles of 4-in. slated originally. The Yakima-Wenatchee lateral will include 71 miles of 10-, 62.7 miles of 8-, and 3 miles of 6-in. line instead of 72 miles of 8- and 68 miles of 6-in.

Facilities to the industrial customers —Union Carbide Nuclear Co., Uravan, Colo., and Vanadian Corp. of America, Nucla, Colo.—include a 36.7-mile 6⅝-in. line from Dove Creek, Colo., to Nucla, and 13.3 miles of 2½-in. line from Nucla to Uravan.

Pipeline Corp. licenses service company

Pipecote Services Corp., Tulsa, newly organized internal pipe protection firm, has been licensed by Pipelife Corp., San Angelo, Texas, to use the Pipelife process in its operations in the states of Oklahoma, Kansas, New Mexico, Colorado and Arizona. Pipecote Services has been granted exclusive operating rights in these five states with operating rights in other states not having exclusive licensees.

Officers of the new organization are A. O. Curtis, who developed and perfected the Pipelife process, as president, J. C. Cooper as vice president and Barney Bedford, secretary-treasurer. Luke Robinson, San Angelo, will serve

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pipeline news • *Cont'd.*

as chairman of the board and Pat Downing, Austin, is a director.

Pipelife Corp. has also granted exclusive franchises to the Pacific coast territory of California, Oregon and Washington, and the Louisiana - Arkansas area. However, the details of the operations in these sections have not been completed.

Internal Pipeline Maintenance Co., Odessa, now operates in the state of Texas with exclusive operating rights for that state, from Pipelife Corp.

Present plans call for the setting up of operating companies to cover the entire United States with internal pipe protection services. Pipelife will serve as holding company and supplier.

Sellers buys injector line from Ohio Injector

The complete line of injectors formerly manufactured by Ohio Injector Co. has been acquired by Sellers Injector Corp., Philadelphia.

Victor F. Sheronas, president of Sellers, said that in addition to manufacturing rights, the transaction includes spare parts, servicing, and reconditioning facilities. The move is part of an overall expansion program designed to broaden the company's injector lines and give greater customer service.

Ohio Injector will devote its efforts to the development of iron, and steel industrial valve phase of its business.

GAS pipeline notes

General Electric Co. plans a $6.8 million expansion of its gas turbine department facilities in Schenectady, N. Y. Present manufacturing facilities will be expanded to include more of the large machine tools required to produce GE's new line of gas turbines. In addition, a headquarters building, which will house engineering, marketing, financial, and employee relations functions, will be established adjacent to the manufacturing operations.

John H. Williams, president of Williams Brothers, pipeline constructors of Tulsa, has been awarded the Order of Condor, the highest honor given by the Republic of Bolivia. Williams Brothers has been especially active in aiding development of petroleum resources in Bolivia. The company constructed all of the petroleum pipelines built in Bolivia in recent years.

Atlantic Seaboard Corp., Charleston, W. Va., has been authorized to construct 86 miles of line in West Virginia and Virginia (Docket G-9758). The $8.5 million project will enable Atlantic Seaboard to meet the needs of its customers in the 1956-57 winter period

Two natural gas pipelines, totaling 38 miles in length, are proposed by Pennsylvania Gas Co., Warren, Pa., in an application filed with the FPC (Docket G-10098). The project, estimated to cost $930,000, will make gas service available to communities from Union City to Fairview, Pa. and augment gas supplies to Jamestown, N. Y.

Under terms of a recent FPC authorization, Kansas-Nebraska Natural Gas Co., Phillipsburg, Kan., will build nine miles of 8-in. pipe and a measuring station to supply gas service to a proposed electric generating plant near Lexington, Neb. Estimated annual requirements of the Central Nebraska Public Power & Irrigation District plant are 5 billion cu ft of gas.

Tapecoat Co., Evanston, Ill., has appointed Tay Holbrook Inc., San Francisco, and Palmer Supply Co., Seattle, distributors of its protective coating.

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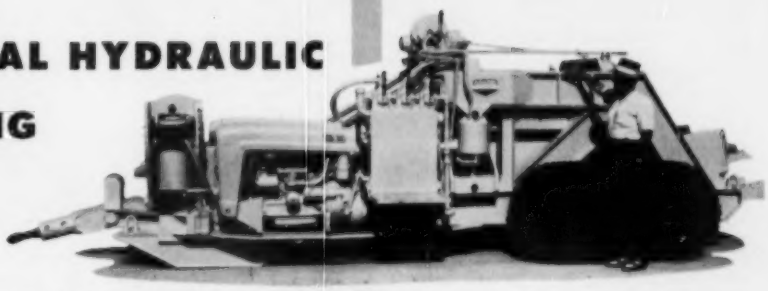

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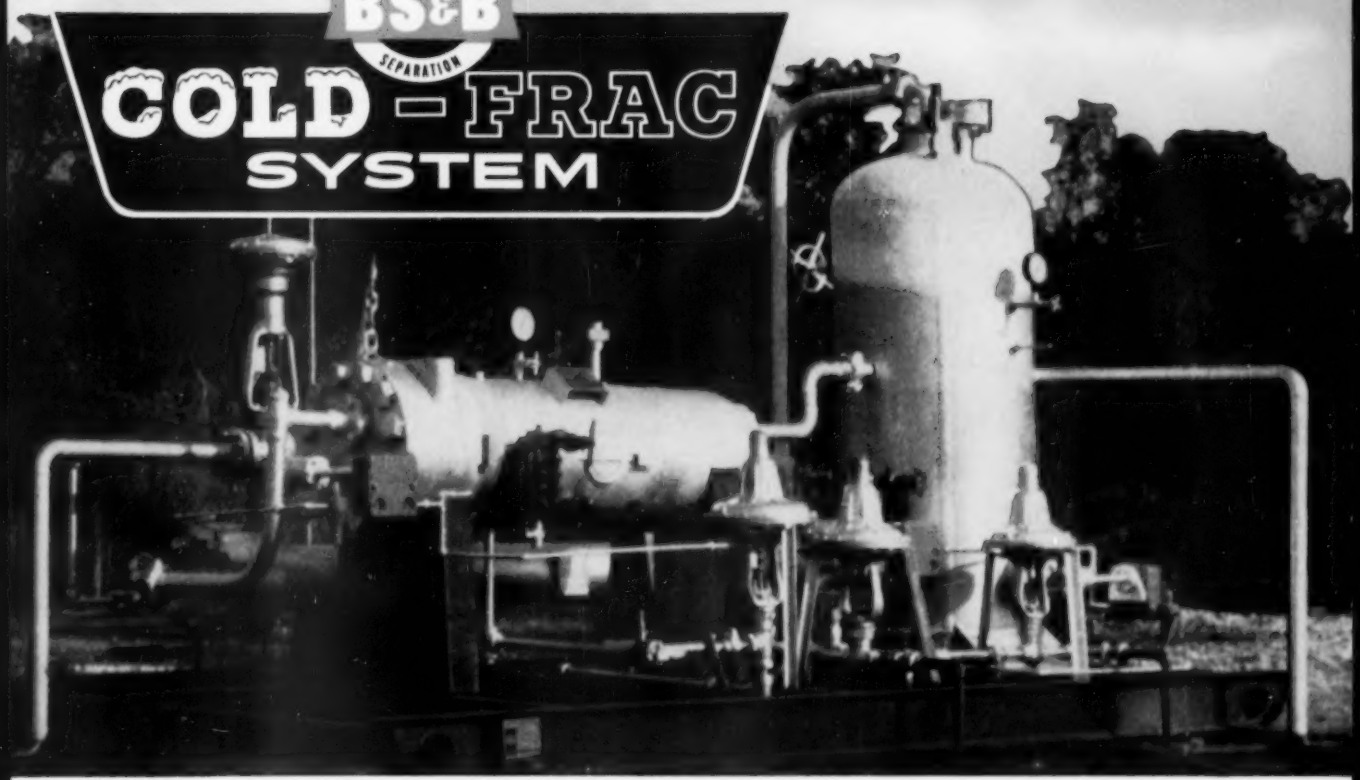

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